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The Past Year

Good trading conditions, with full employment, have, with a few exceptions, been general throughout the foundry industry during 1954. The increase in business differs from the earlier post-war boom, as for the most part buyers have resisted the temptation to overstock. There has been some shortage of labour, but this does not appear to have adversely affected output. Certain sections of the steelfoundry industry, mainly those catering for the quantity production of light castings, could have turned out greater quantities had orders been forthcoming. In steelfounding, however, the year has seen delivered some of the largest castings ever made in this country. The brass and bronze founders, too, have done much better than in 1953, and their gross output should be materially higher than last year. The Association of Bronze and Brass Founders, by way of propagating their advisory-service scheme, have done much good work by disseminating knowledge through their area meetings. Owing to pressure from motor-vehicle builders and aircraft concerns, light-alloy foundries have had their order books well filled. The tendency continues for the die-casting section to expand more rapidly than sand castings production.

The activity of the various sections of the iron-foundry industry were recently reviewed authoritatively at the annual meeting of the Council of Iron-foundry Associations and conditions outlined were generally favourable. The Council's booklet "Years of Endeavour" was more than just a report of material and social progress; it was an earnest of the determination to make the foundry a more desirable industry in which to work. This ideal received concrete support by the putting into operation during the late months of the year of a new iron foundry in the Midlands. No aspect of modern amenities for the workpeople was omitted.

The past year has seen the introduction of the CO_2 process to the foundry industry. Beyond commenting that the process shows great potentialities in certain directions, we will confine ourselves to the reflection that most new processes invariably find their own particular niche, with advantage to the industry as a whole. Shell moulding continues to expand, and it is now quite rare to find a foundry that is not either in production or experimenting. The potentialities and drawbacks of the process are becoming well known, but the very youthfulness of the process leads one to expect "teething" troubles, which, with added research and the provision of new data, time will overcome.

The annual conference of the Institute of British Foundrymen held in Glasgow was an outstanding success, and probably attracted a record attendance for a foundry conference to be held outside London. Mr. John Bell was a very popular choice as president and he is meticulously carrying out his duties. He headed the British delegation to the Florence International Congress and his contribution to the discussions of the International Committee of Foundry Technical Associations were alike sagacious and useful in stating the British viewpoints. The Florence Congress undoubtedly secured for the Italian foundry technicians a high place amongst the leaders of modern developments in the manufacture and sale of castings.

The Past Year

For the first time in this country, there has come into being a national organization catering for the needs of the independent patternmaker. Known as the National Society of Master Patternmakers, it has made substantial progress in the Midlands, London, Lancashire and the North of England, but support from other areas has been meagre.

The Foundry Trades Equipment and Supplies Association is probably larger and certainly more influential than ever it has been during the course of its long career. Its co-operation in committee work, tackling such questions as dust extraction, shop atmospheres and the standardization of blasting-shot size, has been of real benefit to the industry.

Founders Win Claim

Nine months ago, a firm of Walsall ironfounders were expecting payment for a consignment of castings sold a year previously to a local engineering firm, Judge R. H. Norris was told last month at the Walsall County Court. Instead, they received a quantity of castings back from the engineers and a complaint that these were unpaired and distorted.

The complaint, said Mr. Norman William Homer, managing director of Anderson & Homer, Limited, Frederick Street, Walsall, was only received when the firm pressed for payment of an outstanding account. His firm were suing the engineers for £88 3s. 11d., balance, for goods sold and delivered. The defendants, in a counter-claim, alleged that a quantity of the castings bought were unpaired and distorted.

Homer told the court that the defendants bought the clips and clamp castings and by March, 1953, they were receiving a consignment worth £385 8s. 9d. Part of this was settled, but in March of this year the amount claimed was still outstanding.

When his firm pressed for payment, Homer said, the defendants returned about 10 cwt. of castings and scrap, complaining that they were unpaired, distorted, and that in some cases the metal was too hard. Witness claimed that some of the returned castings had not been produced by his firm: those which had appeared to be in order, and some had, in fact, been machined by the defendants.

Labour difficulties, he said, prevented his firm pairing the castings before delivery, but it was understood that if the defendant firm notified them of any deficiencies in a particular type these would be made up. Homer maintained that no complaint was made nor any castings returned until a year after the first delivery was made in March, 1953.

Ernest Geoffrey Sutton, a partner in the defendant firm, claimed that verbal requests to pair the castings had been going on for 18 months. He said that on March 17, Homer apologized for the trouble and said that they could come to some agreement about pairing. Sutton explained that machined castings had been returned because of faults revealed by the machining process. He agreed that a few castings made by other firms might have been included among those returned. Cross-examined by Mr. I. Sunderland, Sutton denied that his firm had had any difficulty in paying their accounts to the plaintiff firm.

Judgment was given for the plaintiff firm for £88 3s. 11d. with costs and the counter-claim was dismissed.

New Metal Refinery in Dublin

A new Irish factory—Metal Refiners, Limited—is now in operation at Clonalkin, Dublin. Its promoters claim that it is capable of producing all Eire's requirements of antimonial-lead, zinc and copper alloys and, in full production, these metals will be available at prices lower than those imported. This is the first Irish metal refinery plant as hitherto all refined metals used were processed in Britain or abroad, frequently from scrap metal exported from Eire.

Metal Refiners, Limited, have a site of over 198,000 sq. ft. and although the initial employees number only 30 working in three eight-hour shifts daily, it is planned that, when in full production, a few months hence, over 100 will be employed. On arrival of plant from Germany, zinc refining will commence; and when in full production copper alloys—brass and gun-metal ingots—will be supplied to specification. Antimonial lead for battery makers will also be produced. According to Mr. J. Stiring, a director of Metal Refiners, Limited, the main difficulty will be to obtain sufficient scrap metal. While there is a ban on the export of scrap metal from England, it is freely shipped from Ireland. A feature of the Clonalkin plant will be an "extractor" which will be installed to neutralize smoke fumes from the furnaces.

More British Melting Equipment for India

Further to their recent order for four arc-melting furnaces, value £115,000, the Tata Locomotive & Engineering Company, Limited, of India, have commissioned a mains-frequency, coreless induction-melting (superheating and holding) furnace from the same supplier—Birlec, Limited, of Birmingham, England. This 5-ton capacity unit will be installed in the same foundry as the four arc-furnaces, thus completing a really modern steel and iron foundry. The new furnace will have a melting rate of 8 cwt. per hr. or a superheating rate of 100 deg. C. per 6 tons per hr.; automatic power-reduction equipment will be incorporated for use on what are strictly holding duties. Flexibility of foundry operation will be the most important advantage obtained from these five furnaces. They will be able to produce (*a*) steel castings of 20 tons and over; (*b*) small steel castings in a fully mechanized foundry; and (*c*) grey-iron or alloy-iron castings in a fully-mechanized foundry. Moreover, the induction furnace can either be used for the production of alloy irons or the economical reclamation of "scrap" cast-iron borings.

Recent Wills

WARRINGTON, THOMAS, metal merchant, of Beckenham (Kent)	£144,149
ANDERSON, C. R., former iron and steel merchant, of Liverpool	£3,512
WORTON, FRED, former works manager of Brown Bayley Steels, Limited, Sheffield	£10,686
WRIGHT, HARRY, who was principal of Dewsbury Technical College from 1936 to 1945	£5,610
BIRCH, CHARLES, managing director of J. Birch & Sons, Limited, ironfounders, of Walsall (Staffs)	£19,103
TONKS, R. G., a director of Bradley & Turton, Limited, engineers and ironfounders, of Kidderminster (Worcs)	£9,748
DIMMOCK, R. H., manager of the Machynys foundry and engineering works of Richard Thomas & Baldwins, Limited	£7,267
WRAGG, H. S., joint managing director and secretary of Marple & Gillott, Limited, scrap merchants, metal brokers, etc., of Sheffield	£21,433

Samuel Fox's New Melting Facilities

Largest Electric Arc-furnace in Europe now in Operation at Stocksbridge

A new 60-ton electric furnace, which is expected to produce over 1,000 ingot tons of steel per week, is now in operation at the works of Samuel Fox & Company, Limited. It is a Birlec-built Lectromelt, with an internal shell diameter of 19 ft., and a power transformer of 15,000 kva. It will be used mainly for high-grade, low-alloy steels. A description is given of this interesting plant and its ancillary services.

Out of the present national steel production of some 18 million ingot tons per annum, more than 1 million are in qualities which may be broadly classed as special steels. Within this category falls the whole range of stainless, heat-resisting and alloy steels, together with high-carbon qualities and others in which a particularly low content of impurities is required. Much of this tonnage is satisfactorily made in open-hearth furnaces, but considerations of quality make electric melting desirable, and sometimes necessary, when the steel is for engineering components whose life is expected to be long or arduous, or whose failure in service might entail particularly serious consequences.

An increasing demand for quality steels of this nature has led to the installation of new, large electric arc furnaces in Britain, the largest and most recent being the 60-ton unit recently put into operation at the works of Samuel Fox & Company, Limited, for alloy and special steels. On shell diameter considerations, this is the largest electric arc furnace in Europe. (There is, however, a furnace in Italy with a shell diameter one foot less but a larger power input, while a Belgian company, Fabrique de Fer de Charleroi, is expected to have a 150-ton (2,000 lb.) capacity Lectromelt furnace installed in the Spring.)

To the Stocksbridge works, the new 60-ton furnace represents a notable addition to its steelmaking equipment. Since the early 1930s, when Samuel Fox & Company, Limited, began to specialize in alloy steelmaking, the company's open-hearth furnaces have been progressively reinforced by electric melting units—first by small, and then large, high-frequency induction furnaces, followed by two 10-ton arc furnaces. In spite of this, electric steel has accounted for quite a minor share of the 250,000 ingot tons which now represents the annual production of the works. The new 60-ton arc unit, which is expected to produce over 1,000 ingot tons per week, doubles the available electric melting capacity and opens the way to the provision of high-quality steels in cast quantities convenient for meeting the growing demands of the engineering industries.

It is expected that the high-frequency and small arc furnaces will be devoted more and more to the melting of stainless, heat-resisting and other highly-alloyed steels, and that beneficial results will arise from this measure of specialization. The new furnace, on the other hand, will be occupied with the production of types of steel with a relatively low alloy content, most of which will find its way as semi-finished steel to the re-rolling drop-stamping and tube-making industries, though some of it will certainly be processed within the works in support of the company's developing interests in special wire and strip.

A more even balance now exists between the company's open-hearth and electric steelmaking resources, but exactly how consumer demand and fuel costs will influence this balance in future, one way or the other, is a matter for conjecture and one that requires future plans for plant development to be left in a flexible state.

Particular metallurgical significance attaches to this furnace by reason of its size relative to the types of steel it is designed to melt. The use for this purpose of arc furnaces of similar or even larger size is not uncommon in America, but in this country much smaller units have been the rule. This 60-ton furnace is accordingly an innovation in Britain and as such is likely to command close attention as a guide to future developments. A brief description of the furnace and its setting may therefore be of some interest.

Samuel Fox's New Melting Facilities

SITE AND BUILDINGS

In the interests of efficient and unimpeded manufacturing operations, and with an eye to possible future developments, it was decided to house the furnace in a new melting shop constructed on open ground at the west end of the works, and at the same time to reconstitute and extend the adjoining raw material yards so as to serve both the new and the existing shops.

To provide the 100,000 sq. ft. of level site on which the melting shop now stands, it was necessary to cut into hillside and excavate some 750,000 tons of earth; this excavated material was carried across the valley on to the opposite hillside and is being used to build up a series of levelled playing-fields within the boundaries of the Stocksbridge urban district.

Apart from excavation work, the preparation of the site has involved the laying of some three miles of railroad track and sidings to link up with the general transport system of the works, the bridging of the Little Don river to provide access to the main Sheffield-Manchester road, and the planting of trees and shrubs to consolidate the exposed ground and furnish a setting in keeping with the rural character of the surrounding land.

Abutments of the bridge take the form of heavy concrete walls to carry precast decking beams. The prestressed precast beams were designed (using the Lee McCall system of prestressing) to take abnormally heavy loading using four 1¼-in. dia. "Macalloy" bars in each beam. The beams, 30 in. deep and 10 in. wide, weighing approximately 9 tons each, made by the Nottingham Gravels & Concrete, Limited, are placed on stainless-steel seating plates on the abutments. The main contractors for this work were Wellerman Brothers of Sheffield and the consulting engineers were Husband & Company.

Stockyard

The stockyard itself comprises two gantries each 90 ft. span and 1,010 ft. long. Each gantry supports two 5-ton capacity electric overhead cranes with limited swing magnets. At the eastern end of the gantries is the alloy store 50 ft. wide by 222 ft. long arranged transversely and over which is a "garage" for servicing the overhead cranes. The store is equipped with weighing and drying facilities prior to dispatch of the special alloys to the melting shops. Altogether, the yards will accommodate 50 different varieties of scrap steel and pig-iron in addition to more than 20 kinds of alloys for special steelmaking.

The steel-framed building has been designed with a monitor-type roof, making extensive use of Castella beams, with plate-type crane girders and columns of fabricated plates spaced at 48-ft. centres. The girders and columns are so arranged as to provide ready communications at high level with protective walkways passing through the web of the stanchions. They also provide easy access to the roof and to the service equipment which has been concealed at crane girder level.

To obtain natural light conditions as far as possible, extensive use of glazing has been adopted, its effectiveness being ensured by large dust-extraction equipment conveying polluted air away from the furnace and casting pits.

Main Block

The main building block comprises three bays on an east/west axis, the largest on the south side, in which the casting, stripping and cooling of ingots is carried out, being 366 ft. long by 70 ft. wide. This bay is equipped with a 100-ton and two 15-ton overhead electric cranes for duties in connection with these operations and for serving the refractory stores, ladle pit, drying furnace and cooling pits, which are also located in this bay.

The centre bay—240 ft. long by 60 ft. wide—houses the 60-ton arc furnace and transformer, together with a control room and basement for electricity and other services. Heavy lifting in this bay is catered for by an 80-ton overhead electric crane, and the general work relating to unloading, storage and filling of charging baskets is handled by a 10-ton crane of similar type.

The third bay on the north side, which is of similar dimensions, is devoted to raw materials. Incoming materials are

FIG. 1.—*General view of the melting shop, showing the 60-ton arc furnace on the left and the casting pits in the background.*

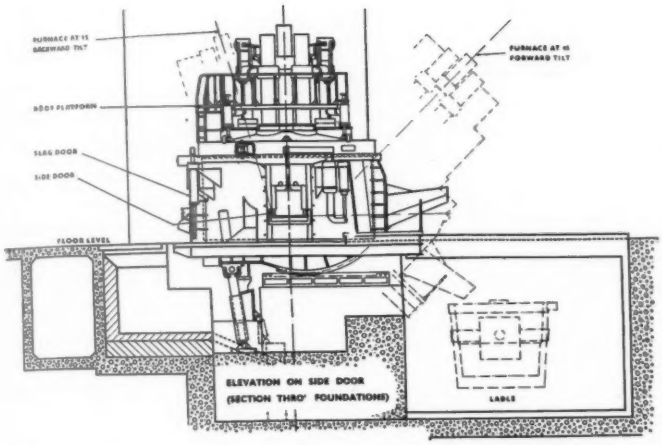


FIG. 2.—*Cross-section of the new furnace.*

discharged from railway wagons into two timber-lined bunkers divided by a platform, into which is built a 60-ton capacity transfer car and weighbridge. The handling of materials is carried out by a 10-ton overhead magnet crane which loads a charging basket prior to its being conveyed by the transfer car from the weigh into the adjoining furnace charging bay, where it is lifted by the 80-ton crane to release its contents into the furnace.

Although the cranes involved have been manufactured by different firms, the crane cabs have been made to a standard specification; master controllers are utilized and the cabs are enclosed, the crane driver being in a sitting position during operation. For dealing with smaller loads of slag-making materials and alloys a diesel-engined ground type charging machine, with ram, is used in support of the crane service.

Electricity, gas and other utility services are brought through a centrally positioned service duct arranged laterally under the main buildings and lead from this point to the required service position. To prevent excessive dust deposits in the control room, and to reduce air movements within the main building, clean air is introduced to the furnace position and the control room through the same underground service duct.

Administration of the plant is carried out in an adjoining building constructed on a steel frame which has been clad on the upper floor with a system of non load-bearing, fully fire-resistant curtain walling, using stainless steel panels as an infilling. This method of construction is in the nature of an experiment in order to gain experience in the use of stainless steel for non-traditional building methods. The system employed is based on a modular approach with a 40-in. grid, the cost of the stainless steel panels being offset by lightness of the supporting steelwork and foundations and in the speed of erection, as the panels can be clipped in as easily as panes of glass.

Electric Power and Equipment

Electric power to operate the plant is supplied by the Yorkshire Electricity Board through a ring main system delivering current at 11,000 v. to the melting shop sub-station. It is expected that when the furnace is in full operation the weekly power consumption of the plant will add nearly 1,000,000 to the 2,000,000 units already being taken by the rest of the works, bringing total consumption up to a level comparable, for instance, with that of the near-by town of Huddersfield.

The furnace equipment is arranged to be operated from the standard high tension, 3-phase, 50 c. per sec. supply, whilst auxiliaries are run from a 440 v.,

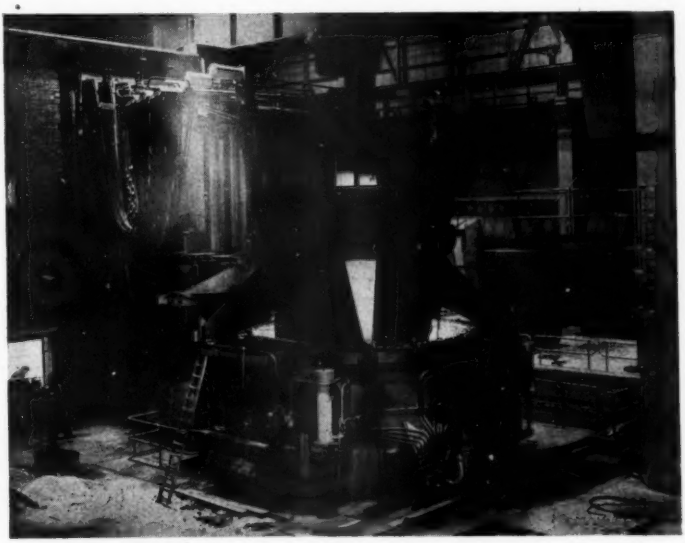


FIG. 3.—*Charging scrap into the furnace, after the roof and electrodes have been lifted and swung aside.*

FIG. 4.—*Control cabin of one of the electric, overhead travelling cranes serving the furnace.*

3-phase, 50 c. per sec., 4-wire a.c. supply. Power to the furnace transformer is controlled by a horizontal drawout-type, triple pole, oil immersed circuit breaker having a rupturing capacity of 250 mva. at 11,000 v.

The furnace transformer by the English Electric Company, Limited, is one of 15,000 kva., 11,000 v. rating, and is of the circulating oil-filled type, the oil being cooled by pumping through an oil/water heat exchange system using some 100 gallons of clean water per minute. It is in two sections, the first transforming up from 11,000 to 22,000 v., at which voltage the tappings are made, and the second section transforming down to the final output voltage. This voltage can be varied in 21 steps from 325 to 90, and it is a unique feature, so far as large arc furnaces in this country are concerned, that the tappings variations are made "on load."

In the main transformer house, accommodation is provided for the main 11,000 v. switchgear and associated control panels in addition to the furnace transformer room and control room. This equipment enables the incoming 11,000 v. supply to be conveyed either directly to the furnace and/or in conjunction with the existing works 11,000 v. works ring main. A low-tension switchroom is also provided to distribute and control the outgoing supplies of 440 v. a.c. power and lighting from a 1,500 kva. transformer in the basement and of 250 V. d.c. power for cranes from a 350 kw. mercury-arc rectifier similarly situated.

The control desks have been manufactured by Birlec, Limited, in conjunction with Samuel Fox & Company, and the main panel comprises the necessary metering, indication and fault alarm equipment, whilst the desk panel houses the control switches for raising and lowering the electrodes (both manual and automatic), hydraulic pumps and main switch.

THE FURNACE

The furnace itself was built by Birlec, Limited, under licence from the Pittsburgh Lectromelt Furnace Corporation. Its design follows American practice for large furnaces and embodies the latest features current on both sides of the Atlantic. It is a top-charged, direct-arc, tilting type with three automatically adjusted vertical carbon electrodes each 20 in. dia. and 6 ft. long, connected to the 15,000 kva. power transformer. The electrodes are by British Acheson Electrodes, Limited (14- and 16-in. electrodes have been the bulk of production hitherto for arc furnaces in Britain, *e.g.*, there are about 16 furnaces in Britain using 14-in. electrodes, and 10 furnaces using the 16-in. variety).

The furnace shell is 19 ft. inside diameter backed with an 18 in. thick refractory lining, the bottom basic refractory thickness being 27 in. and the acid roof, which is suspended at four points, 14 in. thick.

The whole of the refractory lining has been carried out by companies in the Steetley organization—the Oughtibridge Silica Firebrick Company, Limited, and Steetley Doloma (Processing), Limited. The sequence of refractories has been built in as follows:—Sub-hearth brickwork—stabilized dolomite

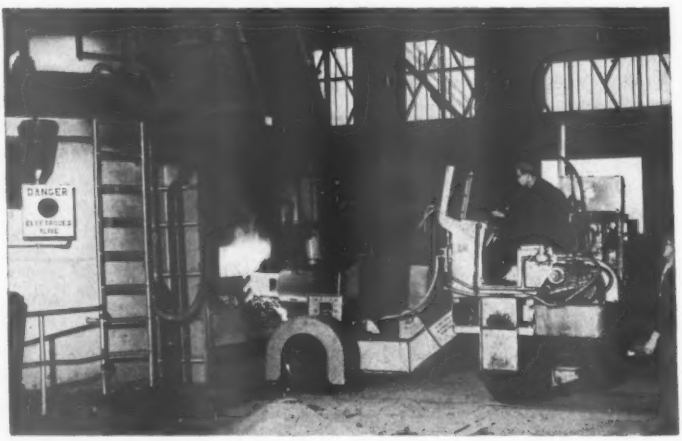


FIG. 5.—*Making additions to the melt, using the Wellman mobile charger.*

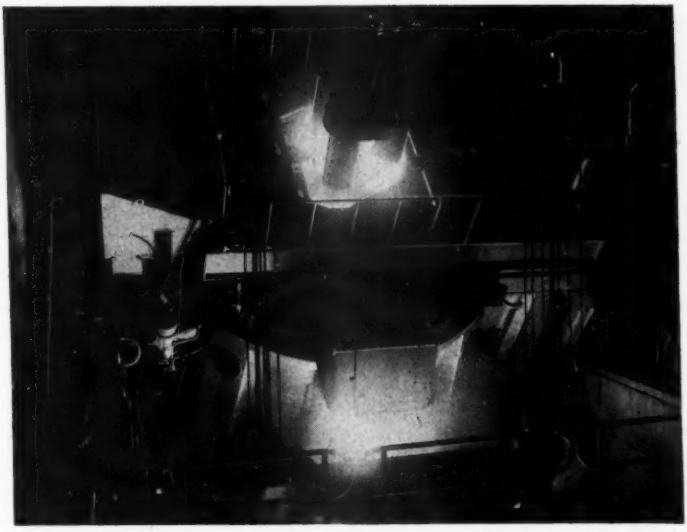


FIG. 6.—*Tapping the furnace.*

bricks; side walls—Britmag magnesite tubes, supported on magnesite bricks; roof—Oughtibridge standard silica; hearth and tapho!e—rammed tarred doloma for the starting up period, followed by graphitized do!omite for regular production; Doloset cement is used for lining the tapho!e; hot repair maintenance—gun cement magnesite through the medium of the Basic Refractories Incorporated (B.R.I.) gun supplied by Steel Plant Auxiliaries, Limited. This unit can "fire" a stream of moist refractory mixture up to 16 ft., propelled by compressed air from a 1¼-in. dia. pipe.

Charging is carried out by lifting the roof and swinging it clear towards the launder on a robust ram, the movement being effected hydraulically. The charging bucket is thereby given complete access. Tilting of the furnace to a maximum of 45 deg. forward and 15 deg. backward is also operated by the hydraulic system. This oil hydraulic system comprises three 30-h.p. motors and pumps situated in the basement, with remotely controlled push button starting and electro-hydraulic operating valves.

The electrode control by the British Thomson-Houston Company, Limited, comprises one amplidyne regulator per phase coupled through a power generator to the electrode winch motor. Provision has been made for four amplidyne motor generator sets, any three of which can be selected. A special feature of this control is that a permanent torque is applied to the winch motor to counterbalance the weight of the electrode masts.

Electrode clamps are made from high conductivity water-cooled copper castings, the slipping and tightening of the electrodes in these clamps being achieved by means of a pneumatically-operated opening and spring closing mechanism.

Water cooling is applied to the slagging and side doors, together with their arches and jambs, and also to the top of the furnace shell which incorporates a continuous bezel ring of box section to act as a stiffener and also to locate the roof ring.

Instrumentation is adequately provided to facilitate furnace operation and control, indicating and recording equipment being provided for electrical supply, including incoming supply current, power supply to furnace, power used per heat, electrode voltages and fault alarm system. Similar facilities are provided for roof and hearth temperature control in addition to equipment for the indication of flow and temperature on the many water supply circuits.

The temperature of the molten metal is measured by means of a Schofield-type platinum/platinum-rhodium thermocouple. A flexible cable connects the couple to a large illuminated dial indicator 20-in. dia., mounted high on the wall and giving the furnace crew a full unrestricted view. A record in ink is made automatically at the same time on a chart recorder in the control cabin.

Safety of plant operation is well covered and in all cases where electrical and mechanical interlocking has been deemed advisable this is provided. For example, electrical interlocks prevent operation of the transformer tap-changing equipment when the circuit breaker is closed, mechanical and electrical interlocks prevent tilting of the furnace unless the roof is closed down on the shell.

Stirring

At the time of ordering the furnace, consideration was given to the question of stirring the bath by electro-magnetic methods, and the plant layout was arranged so that this could be carried out if it were ultimately thought desirable. Subsequent investigation led the company to the belief that a stirrer could both improve the efficiency of the steelmaking process and lighten the physical work involved, for which reasons the necessary equipment, of Swedish origin, will be fitted to the furnace next year.

Steelmaking Practice

The possibility of using the double slag procedure for steelmaking is one of the main advantages of the basic arc furnace. Apart from the very low sulphur and phosphorus contents obtainable thereby, this process, together with accurate control of temperature and conditions inside the furnace, makes possible the production of clean steel to close analytical limits. Cleanness of steel,

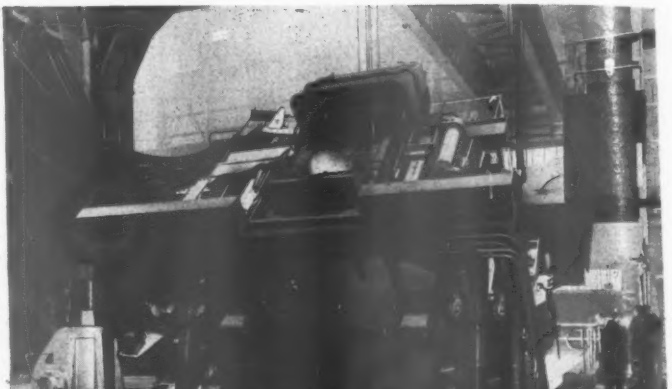


FIG. 7.—*The furnace tilted at the completion of tapping, showing the stainless steel bottom.*

that is to say, freedom from non-metallic particles such as sulphides and slag, is particularly important as these particles, even though very small, may give rise to localized stresses and subsequent fatigue failure in service, while larger particles may produce bursting during forging or drop-stamping into the numerous intricate parts of modern machinery in which alloy steels are now used.

Mention has been made earlier of the fact that national production of special steels now totals more than a million tons per annum. Until recently production on this scale has been thought of as being dependent on heavy programmes of defence equipment manufacture, but latterly it has become clear that the growing outputs of engineering industries not specifically concerned with defence—and in particular the motor, commercial vehicle and tractor industries—present a different type of challenge to special steelmakers. In assessing what will be expected of them in future, they have to measure not only the consequences of a possible new national emergency of a military character, but the converse and more alluring prospect of the growing strength, stability and expansion of these engineering industries, based on rising standards of peaceful living throughout the world.

With these things in mind, there is confidence that the new furnace has a helpful and important rôle to play in the national economy.

Why Men Go On Working

The results of an inquiry by the Ministry of Pensions and National Insurance into the reasons why people retire or stay on at work after reaching the minimum age (65 for men and 60 for women) for the national insurance retirement pension have been published in a report. The inquiry covered some 29,000 insured men and women, who, during the four-week period ended October 11, 1953, were taking their retirement pensions either at the minimum pension age or later, or who were just reaching minimum pension age, but were staying on at work. About 26,000 of these people were interviewed.

Four men out of every 10 men reaching the minimum pension age of 65 took their retirement pensions. Employer's action accounted for 28 per cent. and ill-health for 25 per cent., but including heaviness or strain of work 28 per cent. The chronic sick accounted for 25 per cent. of those retiring. Of the percentage giving employer's action as the reason for retirement or discharge, more than eight out of 10 men said it was because of an age limit (65 was by far the most common) and this was confirmed by employers. Three men out of four said that they would have been willing to go on working with their old employers and most of them said they would, if necessary, have been willing to adapt themselves to other types of work in order to be kept on. The proportion of men who said they were retired by their employer or discharged at 65 was highest in railways, gas, electricity, and water. The proportion was lowest in agriculture and in mining and mining products.

Six men of out of every 10 reaching the age of 65 stayed on at work. Forty-five per cent. said their reason was "financial need," 25 per cent. "felt fit enough," and 20 per cent. "preferred to work." Half of them also stated that the prospect of extra leisure put them against giving up work. Men who retired after 65 gave the same reasons for retirement as those who did at 65. The percentage giving ill-health or strain was 45 per cent., compared with 28 per cent. at 65, but the percentage of chronic sick was 9 per cent., compared with 25 per cent. Employer's action was said to be the reason by 23 per cent., compared with 28 per cent. Nine out of 10, compared with three out of four at 65, said they would have stayed with their old employer.

Men aged 65 giving ill-health or strain as their reason for retirement were more frequently in agriculture and in retail distribution than in other industries.

The retirement pension is payable, normally at the maximum increase rate, at 70, whether a man has retired from work or not. Of all the men taking retirement pensions, 21 per cent. were still working at that age. Over four in every 10 said they were doing so for financial reasons; three in 10 said they preferred to work.

Some Aspects of Shell-moulding Technique

*Discussion of Mr. D. F. Bailey's Jubilee Award Paper**

When this Paper, which won the premier award in this year's Jubilee Competition of the Institute of British Foundrymen, was presented to the Birmingham branch, members endorsed its merit and discussed only points of detail. In this category, methods of resin/sand mixing; the relative value of pre-coated sand; sand properties, and possibilities of sand reclamation were among the topics raised.

MR. HARRISON, in proposing a vote of thanks to Mr. Bailey, said it was apparent to everyone, after hearing the Paper, why Mr. Bailey had won such a coveted award.

MR. H. G. HALL seconded the vote of thanks, and said he had had the privilege of reading the Paper at a very early stage and had helped to pass it forward for the national award. It was, he said, a source of great pride and pleasure to the Birmingham branch in particular, that Mr. Bailey had received the award, and he felt that it was fully justified.

MR. H. W. KEEBLE (K. & L. Steelfounders and Engineers) said he had a particular interest in the lecture, as one of his own staff was the runner-up to Mr. Bailey in the competition. He particularly liked the very down-to-earth way in which the subject was dealt with. The questions he would like to put to Mr. Bailey were as follow:—(1) Had Teepol been tried as a wetting agent in the mix; (2) what percentage of water did Mr. Bailey regard as a maximum allowable; (3) what impurities were permissible in the sand; (4) had Mr. Bailey any view on the value of pre-coated sand for combating the "worm-hole" trouble?

MR. BAILEY replied that he had not tried Teepol himself, but some of his colleagues had, and were not impressed. The sand should be free from water. So far as impurities were concerned, it was a little difficult to tie the sand down to a definite percentage of alkalies, etc., as there were so many variables which could effect this. He would just say that the quantity of clay should be low as should also be the other impurities. The sands recommended were of the Redhill type which were very pure. Both the coated sand and powdered mixtures had advantages under certain circumstances. The coated sand was of advantage in core-making; the powdered process was more flexible in use. The economics of the coated sand compared with resin/sand mix were not very clear, but it was almost certain that the question was reduced to one of securing the most economic percentage of the resin binder.

MR. KEEBLE repeated his request as to whether there was an advantage in using pre-coated sand in relation to the "worm-hole" defect on castings.

MR. BAILEY said that resin segregation was experienced, that would give skin folding.

Sand Properties

MR. DRURY asked whether Mr. Bailey had any experience of the reclamation of sand.

MR. BAILEY replied that some work had been done on sand reclamation and the sand could be re-used, provided the resin was burnt out. Sand reclamation plant was now on the market.

MR. TAFT asked about the strength of the sand, and whether Mr. Bailey would agree that the room-temperature test was only a poor yard-stick and that a sand which would give between 15- and 10-lb. per sq. in. at room temperature probably only showed 6-lb. at higher temperatures. He asked whether the finer and weaker sand would withstand the pouring of a heavier type of casting if it was cast unbaked.

MR. BAILEY said that it might well be that such a shell would stand up to the casting temperature much better than one of fairly coarse sand having an instant grain size.

MR. TAFT said he had tried the double-investment method and obtained a shell which could literally be thrown against a wall and yet would not break.

MR. BAILEY agreed that room temperature testing was purely a yard-stick.

MR. GOYMOUR asked whether zircon sands had been used in shell moulding, because sand of a suitable grain size had been available to him when he was in Malaya, but unfortunately the type of work on which he was then engaged, did not lend itself to shell moulding and he did not have the opportunity of trying it.

MR. BAILEY said he did not know of anyone using zircon sand on a production basis. It was double the weight of silica, and it did also give quite a high-strength shell, even if the resin content was reduced in proportion to its weight. One of the troubles was that if it was desired to have a very thick shell, such a shell tended to fall off the dump bucket when the pattern was returned to the top.

MR. FRANCIS added that zircon sand was also very expensive.

Sand Reclamation

MR. TWIGGER referred again to sand reclamation, and asked whether there was any danger with rapid reclamation of the same sand, that there would be an accumulative build-up of ash or carbon content after a long period.

MR. BAILEY said he did not know what effect there would be over a long period; a further increase of 30 per cent. on the original strength had been found, but the sand was just the same as it was when they started.

MR. FRANCIS asked whether this could be due to the fact that the sand grains became roughened, and Mr. Bailey agreed that that was a possibility.

* Paper printed in the JOURNAL, June 3, 1954

Some Aspects of Shell-moulding Technique—Discussion

MR. FRANCIS said that if the shell-moulding process was to be applied to mechanized production, then some means would have to be found of recovering the sand.

MR. TAFT referred to the reduced chilling effect of shell moulds and asked Mr. Bailey whether in his experience, for a given metal composition one would be a considerable number of points down on hardness figures.

MR. BAILEY agreed with this.

Resin Percentage

MR. TAFT said it was not otherwise easy to get low Brinell hardness with a low-phosphorus iron. He referred to Mr. Bailey's figure of 3½ per cent. resin and asked whether on a fairly heavy casting (a bucket weighing 14 to 15 lb.) 3½ per cent. resin would give a reasonable surface finish.

MR. BAILEY said much depended on the shape of the casting, but he would say that 3½ per cent. resin was sufficient even for heavy jobs.

MR. TAFT said that to his mind there was an overemphasis on the refractory value of the sand, and that if the resin content was brought down to 3½ per cent. one could not get a satisfactory small casting.

MR. BAILEY agreed that it would set up a little pressure but pointed out that the best finish was obtained by the tight packing of the sand grains.

Castings for Enamelling

MR. PALMER referred to an exhibit in vitreous-enamelled cast iron and asked for Mr. Bailey's comments on the economics of producing such a casting.

MR. BAILEY said he would not commit himself on the economics of this, but that he thought it was possible that a coarser sand could be used, as a particularly fine finish was not required in this case. Whether or not it would be an economical proposition, would depend on how good the particular foundry was, and what they expected to secure as a result of adopting the shell-moulding process.

MR. FRANCIS had to bring the discussion to a close. He congratulated Mr. Bailey on his Paper and for his handling of the discussion, and thanked everyone for their attendance, which showed an excellent start to the session. He also welcomed members from the newly-formed Coventry section.

Latest Foundry Statistics

According to the British Bureau of Non-Ferrous Metal Statistics, the output of copper-base castings during October was 5,046 tons. In the first ten months of this year, the production was 50,858 tons as against 40,488 tons during the corresponding period of 1953.

According to the Ministry of Supply, the output of aluminium castings during September was 1,868 tons from sand moulds; 4,275 tons from gravity dies and 1,408 tons as pressure-die-castings.

Sulphur Transfer across a Slag/metal Interface

The influence of the individual elements—carbon, silicon, manganese, phosphorus, aluminium, copper and nickel—on the transfer of sulphur across the iron-slag interface in a carbon-saturated system is discussed by K. M. Goldman, G. Derge, and W. O. Philbrook in the course of a contribution to the American Institute of Mining and Metallurgical Engineers (*Journal of Metals*). The paper is based on a thesis for the degree of Doctor of Science, Carnegie Institute of Technology, and is the third in a series of papers from the Metals Research Laboratory.

In the experiments, induction-heated, graphite crucibles were used, and sulphur-free slag was added to the molten iron containing sulphur and the selected alloy. Slag samples were taken at regular time intervals and analyzed for sulphur and other components of interest. While the authors state specifically that the experiments were not intended to simulate industrial blast-furnace operations, they believe the results can be usefully applied to the blast furnace, if consideration is given to the differences which are known to exist.

In the course of their findings, the authors state that carbon, silicon, manganese, and aluminium all increase the rate of sulphur transfer from iron to carbon-saturated slag with increasing effectiveness in the order named. On the basis of the observed relations between sulphur, iron and manganese in the slag during the reaction, it seems clear that in an unalloyed system, iron is the principal carrier of sulphur across the slag-metal interface. When manganese is present as an alloying element, it not only replaces iron, but causes the overall process to proceed more rapidly. On the basis of chemical similarity, copper and nickel might have been expected to participate in the reaction in the same manner as manganese, but no evidence was obtained.

The elements silicon and aluminium appear to act by supplanting carbon in removng oxygen from the system. Since the oxides of these elements are already present in the slag in large amounts, it would not be observed directly if they acted as sulphur carriers. In the case of aluminium, large amounts of iron are still observed in the slag, both chemically combined and as droplets. The participation of these elements in the reaction can be studied quantitatively through their influence on carbon monoxide evolution.

Use of activities instead of concentrations does not, in the authors' opinion, alter the percentage variation of rate constants for a given alloy with composition. Neither does the consideration of sulphur activity account even qualitatively for the influence of the different alloy elements on the rate of sulphur transfer. For example, manganese decreases the sulphur activity but increases the rate of transfer. Other factors such as interfacial energies, viscosity, and diffusion therefore must be rate determining and additional study will be required to understand these processes.

New Equipment

Large Ajax-Wyatt Furnace

A 15-ton Efco Ajax-Wyatt furnace (Fig. 1) for melting manganese-bronze has recently been started-up in the Birkenhead works of the Manganese Bronze & Brass Company, Limited. This works is engaged almost entirely in the manufacture of marine propellers, the casts ranging from 10 to 30 tons and occasionally even higher. There are some unusual features about the equipment; first, it is the largest furnace of the Ajax-Wyatt type yet installed in this country or, it is thought, in the world. A furnace of similar capacity was installed by the Electric Furnace Company, Limited, in 1952 in Holland, but this furnace was not required to tilt, pouring being from a tap-hole. Secondly, the problem of tilting a furnace of this size and type, and yet providing a stable support for the refractories, was quite a major one. Thirdly, since it was necessary to combine a normal melting rate with the unusually large holding capacity, it was essential to reduce heat losses to a minimum. The major duty of the furnace is to provide metal for at least one large casting (12 to 18 tons) daily, as well as metal for other purposes in smaller quantities.

Furnace Body

The furnace body in general is of welded construction. There are two secondary channels or "slots" each contained in a non-ferrous housing, and complete with a standard 175-kw. furnace-transformer assembly. The transformers are air-blast cooled, the air being brought through the hollow-tilting trunnions. To the two housings is attached the furnace body which, in order to reduce surface-heat-loss to a minimum, is in the form of an inverted frustrum of a right pyramid: *i.e.*, it has, in horizontal section, four curved sides such that the melting space inside the refractory lining is 7 ft. 6 in. "square" at the top and 4 ft. 3 in. "square" just above the slots. The whole body is supported in a tilting cradle which is also of welded construction. It is readily interchangeable with a spare body which can be kept lined, so that there need be a minimum of delay when a new lining is called for. Again, to conserve all possible heat, the furnace is fitted with two deep half-lids packed with insulating material.

Lining

The two slots and the bottom of the body are rammed around formers in the manner normal for this type of furnace, but the furnace body itself is lined with side-arch firebricks backed by heat-insulating bricks. The total lining weight is 9 tons. It is too early yet to give any figures for refractory life, but to date the lining shows little signs of wear.

FIG. 1.—*Overhead view of the 15-ton Efco Ajax-Wyatt electric furnace recently installed by Manganese Bronze & Brass Company, Limited.*

Tilting

The furnace is designed to tilt about the lip axis to approximately 45 deg. for normal working, but a full tilt of 95 deg. is available when it is required to empty the furnace completely, including the slots. A limit-switch normally prevents the furnace being tilted beyond 45 deg. (at which angle the secondary channels are still covered, thus enabling power to be kept switched on), but this switch can be overridden by a special key-operated switch, when it is required to empty completely. A normal (45 deg.) tilting time of 6 min. was called for, and this entailed a total reduction of no less than 35,000:1 from the motor speed of 1,400 r.p.m. to the tilting-shaft speed of 0.0396 r.p.m. To attain this, the drive for the 10-h.p. motor is taken first through a double-reduction spur-type gearbox, then through a single-reduction worm gearbox and so *via* sprocket and chain drive to the main shaft, which drives the heavy tilting chains. The total weight to be tilted when the furnace is fully charged is approximately 45 tons. The tilting motor is of the slip-ring induction type, operated by a drum controller, with its associated resistances.

Electrical Control Gear

The electrical supply to the furnace is taken at 6.6 kv. through a high-voltage switch and 6.6 kv./440 v. step-down transformer. The furnace control-gear comprises a fully interlocked contactor cubicle from which is fed a special "Scott group" rated at 400 kva. Each phase in the secondary side of this group is provided with tappings controlled by a motor-operated off-load tap-change switch, fully interlocked with the contactor. Nine tappings are available, from 130 to 440 v. (at no load) and independent control of each phase provides 17 power levels between 32 and 350 kw. This feature gives very smooth control of the power input over the whole range. Static capacitors are installed, as an integral part of the equipment. The line power-factor is better than 0.9.

Furnace Operation

The priming charge for this furnace is approximately 3¼ tons and rather more than this weight is always left in the furnace as a "standby" bath. With

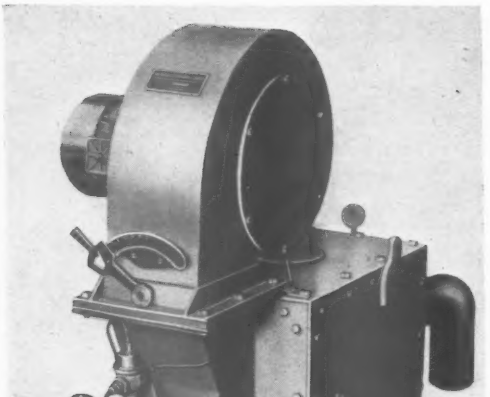


FIG. 2.—*Portable Polford gas-fired mould drier.*

approximately 4 tons in the furnace, the power needed to maintain a temperature of 950 deg. C. has been found to be about 60 kw. The raw material for the furnace consists chiefly of risers off the propeller castings, which can weigh as much as 4 tons each and ingots of new metal of about one ton each. Turnings and borings from the propeller machine-shops are also returned to the furnace. The charging of large pieces necessitates a special charging technique to avoid chilling the metal bath. Pieces of substantial size, relative to the amount of metal already in the bath, are slowly lowered by crane into the metal, thus allowing melting to take place off their lower surface. Typical melting data for a large lump are given as follows:—

Weight of lump.	Time to melt.	Tap No.	Power input.	Power consumption
2¼ tons	1¼ hours	9	350 kw.	195 kwh. per ton.

Although the furnace was designed to carry about 18 tons of metal (15-ton charge plus 3-ton residual charge), a total of 21 tons has already been charged into the furnace on one occasion and 17½ tons removed in one ladle, the tapping time being 6 min.

Metal losses.—In a reverberatory furnace, the metal loss is of the order of 7 per cent. So far, the loss with this Efco Ajax-Wyatt furnace has not been computed, but it is thought to be very low—probably about 1 per cent. It is also interesting to note that a large proportion of the stock of spelter which was placed on the furnace platform in readiness to make up any zinc loss is still there after many weeks' working.

Mould Drier

The portable Polford gas-fired mould drier (Fig. 2) incorporates a new flame failure recording device linked up with a magnetic cut-out and governor valves, thus eliminating any possible chance of unburnt gases being discharged from the drier, and making the unit completely foolproof. Complete temperature control is easily maintained, giving a dustless and constant heat output. The hot-air outlet can be arranged to discharge horizontally or vertically or at an angle to the vertical. The gas burner is designed to take up to 800 cub. ft. per hour of gas at 1½ in. w.g., and temperature adjustment is made possible by means of an air regulator, giving a maximum temperature of 425 deg. C. Under average conditions, one unit is capable of drying a normal mould with a volume of 250 cub. ft. in approximately 4 to 5 hours.

The unit, which weighs about 3½ cwt., is fitted with lifting lugs attached to the main chamber, so that it can be moved easily to any part of the foundry. It may also be used for drying ladles, for incorporating with core-stoves, or for heating large moulds before casting. The drier is constructed of fabricated mild-steel plate, with the combustion chamber lined with high-duty refractory bricks, and is fitted with a fan having a capacity of 1,000 cub. ft. of air per min. at 2 in. w.g. The drive is by totally-enclosed (flanged-type) electric motor. It is a product of the "Polford" Engineering Company, Limited, Newcastle-upon-Tyne, 6, for whom T. W. Ward, Limited, Albion Works, Sheffield, are sole selling agents.

Powered Ventilators

Donaldson Power Ventilator Company report that they have enlarged their facilities, at 11847 Vose Street, North Hollywood, California, U.S.A. The company manufactures powered roof and wall ventilators in four sizes and seven capacities, ranging from 2,100 to 18,600 cub. ft. per min. with motors of one-third to one and one-half horsepower. The ventilators are furnished as supply or exhaust units, with or without back-draft louvres. As supply units they can be fitted with heating or cooling coils and a diffuser. They are of heavy, rigid construction, with sealed-lubricated "life-time" bearings and ball-bearing motors. It is claimed one powered roof ventilator will replace up to 10 gravity ventilators and show a cost saving. Other advantages said to hold for the powered equipment as compared to gravity ventilators are that positive, known quantities of supply or exhaust air are available when needed; there is no damper to close and no winter heat-loss when shut off; and the equipment is not dependent upon varying wind, stack height, or temperature differential.

Board Changes

GEO. W. KING, LIMITED—Mr. H. W. M. King has been elected vice-chairman.

LAMBERT BROS., LIMITED—Mr. John M. Wallace, who is in his 50th year of service with the company, has resigned from the board with effect from December 31.

W. B. DICK & COMPANY, LIMITED—Mr. John S. Rolph, general manager of the marine department, and Mr. R. F. Baldwin, general manager of the electrical department, have joined the board.

WILLIAM NEWMAN & SONS, LIMITED, brassfounders and spring manufacturers, Hospital Street, Birmingham—Mr. Peter Newman, representative; Mr. Kenneth D'Arcy Mason, of Impey, Cudworth & Company, chartered accountants; Mr. H. H. Wood, manager, gearing department; and Mr. R. N. Smith, sales manager, have been appointed to the Board.

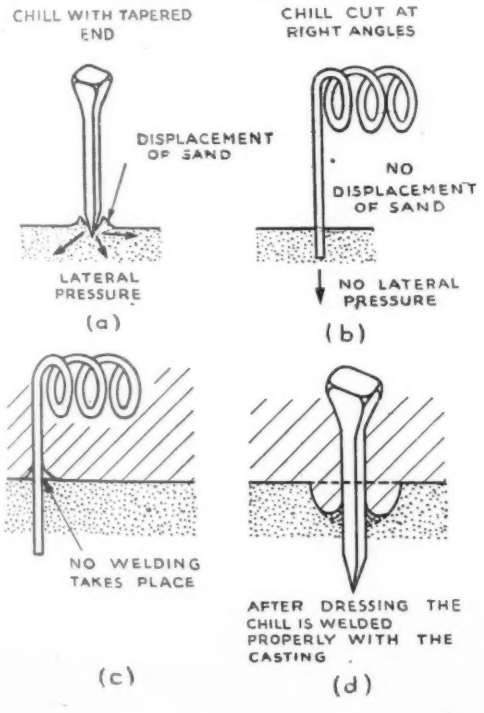
Improving the Appearance of Steel Castings*

Where it is impossible to control satisfactorily the shrinkage of massive parts of castings by feeding, the use of internal chills is certainly justified to bring about directional solidification. There are two types of internal chills—those taking the form of nails with their ends tapered or pointed (Fig. 1 (*a*)) or special ones made from drawn wire in the form of a helix of which one end terminates in right angle (*b*). (This type is patented in France.) The second type penetrates the sand without disturbing the surface of the mould because it induces practically no lateral pressure when setting. The chills with tapered ends, when positioned in the mould, do exercise a lateral pressure and displace around them some layers of sand. If precautions are not taken with regard to the size of these displacements of sand and their position *vis à vis* the ingate, these little mounds can become included in the casting just nearby or become entrained in the liquid metal. When the small sand displacements are not entrained, the inclusions can show up around the stem of the chill, appearing quite near the surface and to the inexpert eye, as though not welded to the metal.

When using the sort of chills which do not disturb the sand (stems without points), they, near the surface of the casting, are frequently only poorly welded (Fig. 1 (*c*)). Here, the related effects of cooling due to the surface of the mould and to the part of the stem buried in the sand are significant and the liquid metal on first contact possesses insufficient heat to assure superficial fusion of the part of the chill stem situated a few millimetres from the surface of the mould.

* Translated from the *Journal d'Informations Techniques des Industries de la Fonderie.* No. 58.

FIG. 1.—*Factors attending the insertion of chill nails or spirals in a mould surface.*



Profitable and Simple Rules

To cure such defects, it is necessary to control very carefully the methods of working and to reduce the human factor to the strict minimum by applying the following rules:—

Each casting must be studied before being put into production and the positioning of the chills should be controlled by suitable marking of the pattern and core-boxes by the methods engineer. The patternmaker will establish the desirable position of the chill by a round- or square-headed nail which will form, during moulding, a suitable mark where the moulder can insert the stem of the chill. This dished mark will serve to localize the sand inclusions, prevent their being entrained in cases where that particular surface is washed by the metal and provide a heat reservoir to assure the superficial fusion of the stem of the chill in contact with the surface of the casting. (Fig. 1 (*d*).)

When fettling, a light blow from a chisel or simple grinding is sufficient to level the chill with the casting and moreover to do so in such a manner that the eye is no longer able to distinguish the position of the chill in the casting. Forethought exercised before starting moulding, can bring about (1) a reduction in fettling costs; (2) greater regularity in production and (3) an improvement in the appearance of the castings—a quality factor which the customer invariably appreciates.

Eliminating Flash

By "Tramp"

An old foundry maxim was: "It is better to have a 'flash' than a 'crush,'" as the former could be removed, but the latter would cause a scrapped casting, due to the sand inclusions resulting.

Whilst this is so, "flash" is costly to remove and in many cases the fettling shop is the "bottleneck" of the foundry and any undue work thrown on this department tends to restrict production. Excessive "flash" is often caused by the moulder removing a portion of the mould by means of a trowel so as to avoid the tearing down of the sand when the top box is lowered over a number of cores assembled in the bottom box and protruding into the top. This operation should be unnecessary, as it tends to introduce a "variable" producing differing thicknesses of "flash"—in some cases (when the moulder has been too generous with his cutting) of dimensions approaching that of the casting itself! To avoid this, it is good policy for the patternmaker to make an allowance on the pattern for "clearance," thereby ensuring that the "flash" is all uniform, of minimum thickness and easy to remove. Again, a different "printing" arrangement for the cores could often eliminate "flash," especially in certain cases, such as lightening cores for feet on casings, etc., when one part of the core could be secured in the top box, and thus do away with the necessity for "clearance" on the top print, which is invariably a cause of "flash." A little more thought in the patternshop could often save considerable time in the fettling shop dealing with unnecessary "flash."

FORTH & CLYDE COAL COMPANY, LIMITED—Mr. J. Walker and Mr. C. Barclay, secretary, have been appointed directors of the company and its associates.

Correspondence

"SOAKING" THE FOUNDERS

To the Editor of the FOUNDRY TRADE JOURNAL.

SIR,—In your article "Soaking" the Founders, you say it is difficult for the layman to understand why there is an increase of only 5s. on steelmaking pig-iron compared with 12s. 6d. on foundry iron and you ask "Are the manufacturing costs so vastly different?"

It is obvious there are substantial gas credits, etc., to blast furnaces in a composite plant. This alone goes a long way towards explaining the lower costs compared with a "merchant"-iron plant with little or no credits. But what is even more to the point is the many millions of pounds spent by the steel industry since the end of the war in modernizing the blast furnace side of the industry, with larger furnaces, ore treatment, new sinter plants and new coke ovens. When one turns to foundry iron, only one entirely new furnace has been erected since the end of the war. The other plants, with minor exceptions, are almost as they were 30 years' ago.

Without any large-scale modernization to take advantage of the most modern techniques, particularly those which reduce the consumption of expensive coke in pig-iron production, it is difficult to see how the foundry industry will be placed for their pig-iron supplies, say in 20 years' from now, except at high prices.

On the other hand, and in fairness to the foundry pig-iron producers, it is questionable whether the huge capital cost to-day of building a modern blast-furnace plant for the production of pig-iron for sale, can ever be economic. If that be accepted, then taking a long view the foundry industry might have been much better served for their supply of raw materials in the years ahead, at the right price, if a policy of peaceful co-existence with the steelmaking interests had been pursued. It is getting late; but it may not be too late for a reversal of policy and it is to be hoped that both the Joint Iron Council and the Iron & Steel Board have the major issue clearly in mind.—Yours, etc.,

N. L. GOODCHILD
(Director for Pig-iron 1939-1945)

December 10, 1954.

Apprenticeship Scheme

The Anti-Attrition Metal Company Limited, Woodlands Park, Maidenhead, Berks, in association with its subsidiaries, the Coronium Metal Company Limited, Reading, and Brecknell, Willis & Company Limited, Chard, have issued an attractive, well-illustrated booklet covering the facilities they have organized for assuring that their indentured apprentices receive a well-balanced training. To make this effective, a hostel—a really attractive suburban villa—has been acquired. The group photograph of the apprentices is as fine an advertisement for the scheme as could be devised, as the young men have the appearance of as good a cross-section of British youth as could be mustered. The theoretical side of the course is catered for by attending instruction leading to the Ordinary National Certificate in Engineering. Being a foundry firm, the City and Guilds of London craft examinations might usefully have been included.

HONEYWELL-BROWN, LIMITED, have opened an area office in Cardiff at 95, Exchange Buildings, Mount Stuart Square. It is under the supervision of Mr. L. G. A. Gabe. It is the sixth area-office to be established in Great Britain.

New Chairman for Newton Chambers

As briefly announced last week, Mr. Peter Roberts, M.P., for Heeley, Sheffield, has been appointed chairman of Newton, Chambers & Company, Limited, Thorncliffe Works, Sheffield. He is a barrister, 43 years old, and joined Newton Chambers in 1946. He succeeds his father, 73-year-old Sir Samuel Roberts, who has been chairman of the firm for 20 years. Sir Samuel has resigned this position as well as the chairmanship of Thorncliffe Collieries, Limited. He is a former Lord Mayor of Sheffield who had been educated at Harrow, and admitted a solicitor, but went into industry. In 1927 he became a director of Newton, Chambers & Company, Limited, and became chairman in 1934 on the death of Mr. Walter Newton Drew. He was Lord Mayor of Sheffield in 1919 and received the freedom of the city. His father was Lord Mayor in 1899-1900.

In 1921 Sir Samuel became M.P. for Hereford, and later held the seat for Ecclesall, Sheffield, until 1935, when he was made Master Cutler. He was chairman of Committee "A" at the House of Commons which was dealing with industrial and commercial matters. Newton Chambers employ almost 5,000 people. The new chairman takes over on January 1, 1955.

Antique Cast-iron Seat

"Sir—Could any reader, knowledgeable about iron-founding, help me to identify this mark? It occurs on the back of an extraordinary ornate garden seat in cast-iron, which was rescued from some bombed site in London. The delicacy of the work—a design of well-modelled animals—strikes me as quite remarkable, and I would like, if I could, to trace its origin."

The above letter, which appeared in the Midlands daily Press, brought forth the following erudite reply from Dr. J. E. Hurst:—

The incision is an English Registration Mark, current during the period 1842-1867. The mark was placed on four types of article. A roman numeral in a circle at the top was used as follows: I for metal objects; II for wooden; III for glass; and IV for earthenware. Under the circle a letter indicated the year of manufacture, T for instance, relating to 1867. Figures at the right showed the day of the month and letters on the left indicated the month. Furthermore each manufacturer had a key number which was displayed at the bottom of the mark.

ALLIS-CHALMERS MANUFACTURING COMPANY, Milwaukee, Wisconsin, is to design, construct, and instal the power generation, heat transfer, and special equipment for the power cycle in the first atomic energy power station to be built in the United States. The project has been authorized by the US Atomic Energy Commission as part of its five-year programme for the development of competitive electrical power from nuclear fuel. The reactor is to be built in Du Page County, Illinois, and will use slightly enriched uranium fuel. Completion is scheduled for 1956.

Control of Sand-handling Plant

A foundry example was selected by Igranic Electric Company, Limited, at the Mechanical Handling Exhibition to demonstrate the way in which collaboration between the motor-control-gear specialist, plant manufacturer and user can achieve a most efficient and economical method of plant utilization. The Igranic automatic control gear, which was exhibited by kind permission of K. & L. Steelfounders & Engineers, Limited, is for the foundry sand-handling plant at Letchworth, which deals with 10 tons per hour. The example was concerned only with that part of the foundry which handles the collection, cleaning and storage of the used sand and the flow in Fig. 1 indicates the sequences of operation.

Important features of multi-motor-control panels of this type are that: (*a*) centralized conetrol, enables the contactor panel and control desk to be sited in a position remote from the plant and dust-laden atmospheres, which prevents unauthorized interference and considerably reduces and simplifies maintenance. The contactor panel is operated from one point from a control desk; (*b*) a common isolator protects all drives, thus permitting immobilization of the whole plant from one point, rendering it safe for maintenance and inspection; (*c*) sirens, warning plant personnel that conveyors and elevators are about to run, are automatically operated at the appropriate times by the contactor panel; and (*d*) emergency "stop" pushbuttons are installed at carefully selected points of the plant, permitting instant stoppage in the case of an emergency. Also, efficient motor protective devices can be incorporated and the design of the control gear is dictated not only by practical requirements, but with due regard to appearance.

Sequences of Operation

The sequences of operation are as follow:—

No drive can be operated until the button marked "re-set" on the control desk is pressed. It is assumed all selector switches are in the "sequence" position and then the plant is ready to be operated. Each drive must be started from its own pushbutton, the majority of which are mounted on the control desk, but electrical interlocking devices on the control panels are so arranged that the drives can only be started in their correct order, sequence of starting being in the opposite direction to material flow. Across-the-line starting is used for all drives with the exception of the sand cyclone, which is started by the stator-rotor method, two accelerating contactors being used.

First Sequence

The cooled-sand elevator is provided with an underspeed switch, so that if the speed of this drive should drop below a pre-determined level, the circuit to the operating coil of its controlling contactor will be interrupted and the contactor will open and the drive stop. Electrical interlocking circuits are arranged so that the drives following will also stop. Should this elevator come to a sudden stop due to jamming, pins fitted to the coupling between motor and elevator will shear, the shear-pin limit-switch will operate, the contactor will open and stop the motor and subsequent drives as before.

When the rotary-screen motor is started, interlocking circuits on the contactor panel operate four sirens, which sound intermittently for a period determined by the setting of a process-timer mounted on the panel. Not until the sirens have ceased to sound can the next drive be started. The No. 1 knock-out elevator is fitted with underspeed and limit switches as described for the cooled-sand elevator. The No. 1 Overband separator cannot be operated until its magnet coils have first been energized. A series relay is connected in the coil circuits so that should one of the coils burn out, the separator will immediately stop. When the faulty coil has been located, a resistor provided on the contactor panel can be connected in the circuit as a temporary measure until the coil can be replaced. When the cross belt has been started, a relay operates, which enables sequence No. 2 and/or No. 3 to be commenced. These two sequences are dependent upon sequence No. 1 and cannot be operated unless the whole of that sequence is running.

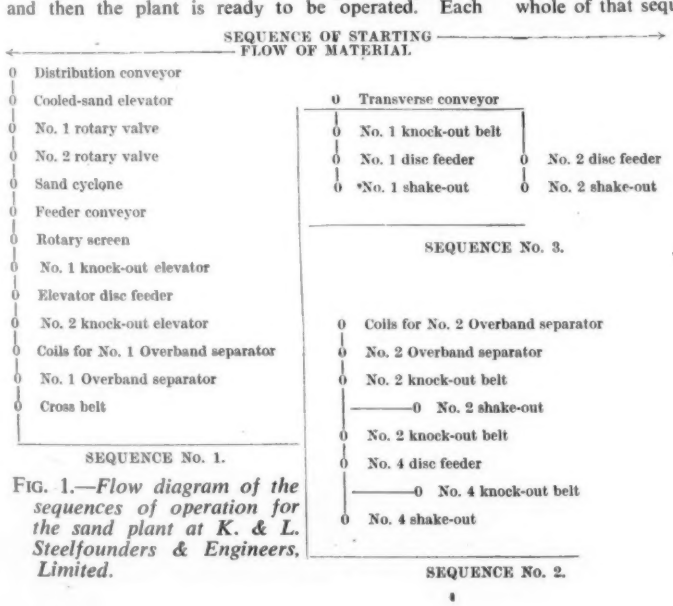


FIG. 1.—*Flow diagram of the sequences of operation for the sand plant at K. & L. Steelfounders & Engineers, Limited.*

Second Sequence

No. 2 Overband separator cannot be started until its magnet coils have been energized, as described for the separator in sequence No. 1. When the No. 2 knock-out belt is running, the No. 3 shake-out can be started. This drive is controlled from a pushbutton station mounted adjacent to it, and not from the control desk. Stopping the drive has no effect on the remainder of the sequence. When No. 3 knock-out belt is running, the No. 4 disc feeder is next in sequence, but the No. 4 knock-out belt has no effect on the remainder of the sequence. When the No. 4 disc feeder is running, the No. 4 shake-out can be started from a pushbutton station mounted adjacent to it. So that the operator may know when to start, an indicator lamp is provided which is arranged to light up when the No. 4 disc feeder starts.

Third Sequence

The transverse conveyor is the first to be started, and then the No.

Control of Sand-handling Plant

2 disc feeder and/or No. 1 knock-out belt. Shake-outs Nos. 1 and 2 are controlled from pushbuttons on site, and not from the control desk. When the disc feeders are running, indicating lamps at the corresponding shake-outs light up, so that the operators may know the correct time to start.

General

The master or emergency "stop" buttons immediately halt all drives, and no sequence can be re-started until the "re-set" button on the control desk has been operated. Any drive can be operated out of its correct sequence by moving its selector switch to "test" position. This renders all subsequent drives inoperative. Pressing the "stop" pushbutton for any drive will immediately stop that drive and all subsequent drives. Should any drive become overloaded, its overload relay on the contactor panel will operate, and stop that drive and subsequent drives.

Carbon Restoration Technique

Recent American Experiments

The endurance limit of a decarburized, investment-cast steel may be improved in certain cases by the carbon restoration of its decarburized surfaces. A steel containing 0.30 to 0.45 per cent. C, 0.6 to 1.1 Mn, 0.5 to 0.35 Si, 0.06 max. S, and 0.06 per cent. max. P (S.A.E. 1040) was examined by Capt. W. H. Shafer, U.S. Army, at Watervliet Arsenal, under various types of heat-treatment, and his findings are summarized below.

Carbon restoration is a comparatively new heat-treatment for steels. Armor reports that the continuous carbon restoration furnace recently installed in the Union Drawn Steel Division of the Republic Steel Corporation has increased production of their steel products. He states that the carbon restoration process eliminates machining decarburized surfaces or addition of carbon by carburizing or cyaniding. Machining wastes material and is expensive. Carburizing and cyaniding are less expensive than machining; however, the surface hardness is usually too high for intended application.

Replacement or restoration of carbon in decarburized surfaces in steels is only one phase of controlled carburizing as used in industry. To-day manufacturers are producing many items from low-carbon steel (0.10 to 0.20 per cent. carbon) that formerly were produced from pearlitic steels, and high production rates are obtained by such forming operations as shearing, deep drawing, extruding, or stamping. The low carbon content will not be satisfactory, of course, where specifications for the finished part require a high hardness and high tensile strength, and carburizing is adopted.

Personnel at the Watervliet Arsenal are interested in restoration of carbon to decarburized surfaces in investment-cast ferrous alloys. All will appreciate the importance of high hardness and tensile strength on the surfaces of heat-treated parts for armaments. Little or no machining is required on some gun components produced by the investment casting process, thus restoration of carbon in the carbon deficient surfaces becomes an important step in the production of cannon and cannon parts.

Manufacturers of heat-treating equipment have different methods for controlling the carbon content. In some carburizing equipment, carbon equilibrium of the atmosphere can be predicted on the basis of the carbon monoxide content and the dew point. A Leeds & Northrup "Microcarb" atmosphere control was used with a Series H Homocarb furnace for the carbon restoration tests.

Results Summarized

Carbon restoration approaches the 100 per cent. value as a limit. Practical limits of carbon restoration for production runs would not be greater than 75 to 90 per cent.

Microhardness traverses appear to be an effective method for determination of carbon restoration rates and for measuring the amount and total depth of decarburization.

Investment-cast fatigue specimens with 0.275 in. min. dia. have a total decarburized depth of 0.035 to 0.04 in. The oversize specimens with 0.35 in. min. dia have a total decarburized depth of 0.05 in. Therefore, increased section size increases the total depth of decarburization.

Banded microstructures were noted in furnace cooled specimens following the carbon restoration. This "banding" condition was reduced by using a double normalizing heat-treatment. Also, this condition was not found except during slow cooling through the transformation temperature ranges. Diffusion of carbon from inner high-carbon areas to the low-carbon decarburized surface layers results in a banded microstructure during furnace cooling.

The Leeds & Northrup carbon restoration equipment which was used proved effective in restoring the carbon to the decarburized investment castings. Carbon restoration in the investment-cast S.A.E. 1040 fatigue specimens improved the fatigue strength approximately 20 per cent.

The endurance limits for the various conditions of test were as follow:—(*a*) 12 hrs. carbon restoration, 56,000 lb. per sq. in.; (*b*) 5 hrs. carbon restoration, 54,000 lb. per sq. in.; (*c*) decarburized surfaces machined from oversize specimens, copper plated, and heat-treated with specimens that were carbon restored for 12 hrs., 53,000 lb. per sq. in.; (*d*) decarburized specimens, copper plated and heat-treated with specimens that were carbon restored for 12 hrs., 47,000 lb. per sq. in.; (*e*) decarburized and no carbon restoration, 44,250 lb. per sq. in.

The endurance limits for the specimens were somewhat lower than one-half the ultimate tensile strength. The highest curve gave an endurance limit that was approximately 43 per cent. of the ultimate tensile strength.

Excessive microporosity and non-metallic inclusions in the specimens created high localized stress concentrations that increased the scatter of test points.

Heat-treatments employed in this series of tests are more fully discussed in a report on "Fatigue Life of Decarburized and Carbon-restored Investment-cast S.A.E. 1040 Steel," which formed the subject of a Masters Thesis in metallurgical engineering at Rensselaer Polytechnic Institute, Troy, New York.

SAMUEL OSBORN MUSHET TOOLS (AFRICA) (PTY.), LIMITED—a company associated with Samuel Osborn & Company, Limited, of Sheffield—are to build a factory at Pietermaritzburg for manufacture of small tools.

FOUR BELLS for a clock ordered from a Derby firm of clockmakers by Queen Salote of Tonga, are being made at John Taylor's bell foundry at Loughborough. The Queen asked that the clock, which is for the palace chapel at Nuku-Alofa, should have Westminster chimes. It is weight-driven and hand-wound, and has three 4-ft. dia. dials.

Iron and Steel Research

Current Projects of Interest to Foundrymen at the London Group of B.I.S.R.A., Laboratories

The Battersea, London, Laboratories of the British Iron and Steel Research Association have now been in existence for seven years, and have been constantly improved and developed. "Open days" were held recently to show the research work that is carried out there, and to describe industrial trials based on Battersea. A survey is given here of some of the research in progress for the iron and steel industry, much of which is complementary to that being carried out by the foundry research associations.

Nine years ago, in 1945, the British Iron and Steel Federation, on the advice of the Department of Scientific and Industrial Research and in consultation with the Iron and Steel Institute, set up the British Iron and Steel Research Association as an independent body. The Federation undertook to supply the basic funds and the D.S.I.R. to augment these. Other lesser sources of income have since developed.

There are now in this country three closely linked yet autonomous bodies serving the iron and steel industry as distinct from the foundry industry, namely, the British Iron and Steel Federation, the Iron and Steel Institute and the British Iron and Steel Research Association. Between them they cover all the required fields of co-operative activity. Broadly speaking, the Federation is the trade association deciding industry policy and providing machinery for giving effect to it, the Institute is the "learned society" providing for the technical interests of the men in the industry. B.I.S.R.A. provides for the technical and research needs of the iron and steel industry itself, so far as these are best done co-operatively.

At the commencement, the Association was provided with facilities at the Universities of Sheffield and Swansea, a small corrosion laboratory at Birmingham and the present iron making laboratory at the Imperial College of Science and Technology. Since, a large laboratory has been built at Sheffield in Hoyle Street, which houses the Association's work on the making, working and metallurgy of steel (these laboratories were described in some detail in the JOURNAL of November 26, 1953). The need for laboratories for all the divisions of the Association was recognized from the first and all are now provided for.

The first department to be provided for in London (after the Iron Making Division) was the Physics Department. In October, 1946, part of the present building in the Battersea area was leased from Powell Duffryn, Limited, whose research department occupied the rest of the building. These rooms were converted into the physics laboratories and still form the greater part of that department's accommodation. Shortly afterwards one of the laboratories was taken over by the Chemistry Department and work on the physical chemistry of steelmaking was begun.

The Battersea Laboratories at 140, Battersea Park Road, S.W.11, were officially opened by the late Lord Rayleigh in October, 1947, and by that time had the services of their own workshop, photographic section and drawing office. In the following year a garage was converted into a laboratory for the Electrical Section of the Plant Engineering Division and in 1949 the Refractories Section of the Chemistry Department started work at Battersea. In 1951 Powell Duffryn, Limited, terminated their research in the rest of the building, the whole of which was then acquired by B.I.S.R.A. Many alterations and repairs were required, and these are continuing, but ample space is now available for civil and mechanical engineering laboratories and for the corrosion laboratory which was moved to London to join the rest of the Chemistry Department.

The building is still far from ideal for a research establishment, but has been gradually converted as the work has expanded. This is inevitably a slow process, as the work of reconditioning and conversion is being done while the building is in continuous and increasing use. Each change is, however, part of a comprehensive plan which will eventually provide the Association with laboratories planned around its work—a policy which was preferred to that of deferring the work until fully satisfactory accommodation could be provided.

The work of the British Iron and Steel Research Association's London group of laboratories was displayed for members and guests last month. The researches shown were mainly those of the Physics and Chemistry Departments and the Plant Engineering Division. They included some of the work of the Operational Research Section and some of the researches of the Iron Making Division which are carried out at the Imperial College of Science and Technology. Descriptions of some of the individual researches are detailed in the following survey.

Physics Research

The Physics Department, of which Mr. J. Savage, B.Sc., F.Inst.P., is head, is regarded as a service unit created to carry out research for the divisions of B.I.S.R.A. These correspond closely with the processes of the iron and steel industry from iron-making to the mechanical working of steel. The functions of the Physics Department approved by the Council in 1946 are: (1) to keep in touch with the advances of physical science with a view to possible application in the iron and steel industry; (2) to carry out research into the more fundamental physical problems connected with the

Iron and Steel Research

work of the Association; and (3) to carry out research and development in physics on behalf of the Divisions.

The Physics Department is divided into five sections, each of which is concerned with particular branches of physics which are important for carrying out research of interest to the steel industry. These are: (1) Fuel technology; (2) instruments; (3) fluid dynamics; (4) steel casting; and (5) general physics.

Fuel Technology

Research in and application of fuel technology is undertaken by the Fuel Technology Section, mainly on behalf of the Fuel Committee and its sub-committees, but also by contract from other Divisional Committees. This section is considering a large variety of problems involving heating and temperature measurement—a number of instruments, particularly pyrometers, have been developed, many of direct interest to founders, whose problems in this field are very similar to those of steelmakers.

Heat Conservation (Casting Bay and Soaking Pit):

The aim of this work is to reduce the fuel used in soaking pits to bring ingots to a uniform temperature before rolling in primary slabbing or blooming mills. The heat required ranges from 9 to over 20 therms per ton at different works, with an average from the United Kingdom of 16 therms per ton. It is not always fully appreciated that liquid steel leaving the open-hearth furnace or Bessemer converter is very much hotter than the ingot arriving at the mill, so that in theory no fuel should be required, and it should be possible to use the surplus heat, amounting to about 5 therms per ton of steel. There is, however, little possibility of recovering the excess heat economically, as a proportion of it is dissipated into the cast-iron moulds and bottom plates used to contain the solidifying ingots, but unnecessary heat losses could be considerably reduced.

The problem is being studied in several ways:—(*a*) Surveys of works practice in which data are obtained of the many factors which affect the production, handling, and movement of ingots between steel plant and rolling mill, and (*b*) cooling of ingots, in which studies have therefore been made of the rate at which ingots cool, using a mould as a calorimeter, to ascertain the magnitude of the variations that can occur and the conditions that cause them, and thus to reduce stripping times to a minimum.

B.I.S.R.A. Burner:

In the types of steam-atomized oil-burners mainly used on open-hearth furnaces there is a considerable loss of available energy and, in consequence, in order to obtain adequate control of the flame it is necessary to operate with a higher proportion of steam to fuel than is desirable. Fundamental work by the Fluid Dynamics Section showed that improvements in design were possible. New burners incorporating these improvements, installed on open-hearth furnaces, have proved that, compared with the conventional burner, productivity can be maintained with a lower steam: oil ratio, or increased with the original steam: oil ratio. In both cases, fuel consumption per ton is reduced.

The same principle, of making maximum use of the available energy, has been applied to a combined coke-oven-gas and oil burner, the oil nozzle being in the centre of the gas nozzle. This has resulted in a more compact flame and, in addition to slightly improved productivity and fuel consumption compared with the previous burner, there has been a marked increase in the furnace life (see Fig. 1).

Gas Cleaning:

A cheaper method of cleaning would be an advantage, not only for blast-furnace gas, but also for removing dust discharged to the atmosphere in waste gas from furnaces, crushers, and other plants. Examination of the problem showed that to remove dust by wet methods, the water must be in droplets of comparable size to the dust particles and must move at a high relative velocity in order to impinge upon them. Sprays produced by pressure jets or by blast atomizers provide droplets of widely differing size, so that a large proportion of the water is ineffective, being composed of droplets which are either too large to impact the particles, or too small to maintain the required velocity. Spinning discs,

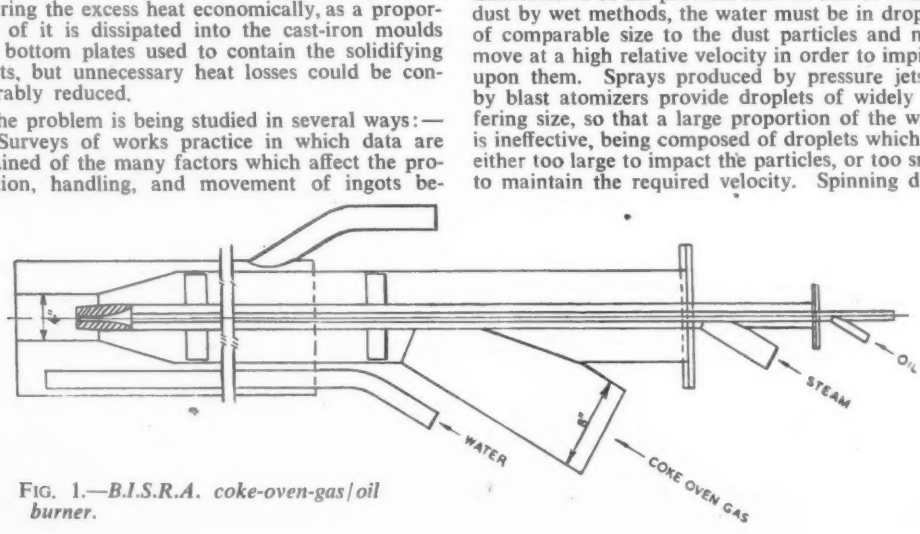


FIG. 1.—*B.I.S.R.A. coke-oven-gas/oil burner.*

which had been reported to give a uniform spray, were therefore considered, and a prototype unit was constructed for cleaning up to 140,000 cub. ft. per hr. of gas. In it the gas passes through an annulus surrounding five discs mounted on a common shaft, rotated at speeds up to 5,000 r.p.m. The cleaning section is followed by a bank of irrigated cyclones to remove the water droplets carried forward in the gas stream. Laboratory and works trials have shown that for dust particles from 1 to 76 microns in diameter, and with concentrations up to 2 grains per cub. ft., overall efficiencies exceed 98 per cent.; when, however, a substantial proportion of the dust is below 1 micron in diameter, the total efficiency is about 60 per cent. Examination of the water-droplet size and distribution shows that, at the water flow rates required, the simple discs used are not entirely satisfactory and modifications are being made in order to improve them.

Fluid Dynamics

The problems of flow which are of interest to the steel industry, whether the material flowing is a gas, a liquid or a granulated solid form the field of study of the Fluid Dynamics Section. Much attention has been directed to the aerodynamics of open-hearth furnaces and a succession of related projects has started from this. Models are particularly useful in this field as the high cost of building and operating even the most efficient furnace makes it impossible to consider any modification to a production furnace that is not supported by the strongest evidence that no appreciable deterioration in performance will result.

The earliest work on models concerned furnaces fired with pre-heated gas, a case which most nearly corresponds to a constant density and viscosity system to which the Reynolds similarity criterion strictly applies. In an oil-fired furnace, however, the fuel enters the furnace as a spray of liquid droplets and a suitable basis of similarity has to be found before such a system can be simulated by a model. As the velocities in the burner jet are much higher than elsewhere it was considered that free-jet theory might provide a sufficient approximation, and the conclusions to be drawn from this theory have been compared with operating data.

The result has not only provided a basis for model work but has introduced a new concept of the functions of burners as being primarily jet-thrust producers rather than atomizers. A logical result of this has been the design of a burner nozzle based on this principle, which has been introduced successfully into the industry. For, although the greatest improvement in thrust from a burner is often the elimination of all features which permit appreciable wastage of pressure before the final nozzle, it is also found that the same thrust can be obtained from less steam if a nozzle is used in which the throat is followed by a short length in which the oil droplets are further accelerated by the steam before discharge. It has been shown that there is a further advantage to be gained by the use of a suitably shaped cross-section, and arrangements

FIG. 2.—*Burner reaction measurement.*

are in hand for the commercial production of a burner employing the B.I.S.R.A. nozzle.

(*To be continued*)

New Catalogues

Radiators. A leaflet received from Standard & Pochin Bros. Limited, Evington Road, Leicester, illustrates and describes a line of "Calorad" space-heating radiators, utilizing steam or hot water.

Gas in Industry. The Gas Council has recently published a revised version of this well-known brochure. It is interesting to note that the list of important industries in which gas is used includes fish-frying, but excludes foundries. The foundry industry, however, has two illustrations in the opening section and fish-frying none. The brochure is beautifully produced and nicely illustrated.

Machinery and Castings. An American catalogue emanating from the Eaton Manufacturing Company of Cleveland, Ohio, is of a unique character. On each page opening are shown photographs of the product of a works, a black-and-white outline drawing of the factory, a short list of its principal products and the industries serviced. The firm have about a dozen plants, but one of the best known in this country is that making cast-iron die-castings.

Roofing. Scaffolding (Great Britain) Limited, Mitcham, Surrey, have issued a particularly attractive brochure covering the application of the lattice shell type of roof. Foundrymen are very interested in roofing and an Australian manufacturer of castings once experimented with a number of different types of construction. From a perusal of this brochure, there is wide choice of design all based on the application of the lattice-shell structure. The brochure is available on writing to Mitcham.

Uniforms and Industrial Clothing Catalogue.—Published by the United Trade Press Limited, Boswell House, Gough Square, Fleet Street, London, E.C.4. Price 10s.

This catalogue, devoted to industrial clothing, is of interest to the foundry, as it deals not only with the general question of overalls, but there is also a section devoted to industrial goggles, yet as the larger works have canteens and first-aid stations, the catalogue has an added interest in that field. It runs to over 200 pages and is not only well-illustrated but has samples of textile materials. It is the sort of book which should be of great use to the buyer.

Company Meeting

Hale & Hale (Tipton), Limited

TRADING DIFFICULTIES LARGELY SURMOUNTED

Mr. W. Edgar Hale on the Achievements of British Industry

The 18th annual general meeting of Hale & Hale (Tipton), Limited, was held on December 15 at Dudley, Mr. R. C. Leppington (vice-chairman and managing director) presided in the unavoidable absence of the chairman, Mr. W. Edgar Hale, M.I.Mech.E. The following is an extract from the chairman's circulated statement:—

The profit and loss account of the holding company shows a trading profit of £51,779, which compares with a figure of £89,208 for the previous year and shows a decrease of £37,429. There is a net profit for the year of £19,796. Last year the net profit amounted to £29,280 and there is thus a decrease of £9,484. Your directors recommend a final dividend on the ordinary shares at the same rate of 17½ per cent., less tax, to bring the total distribution for the year again to 25 per cent. less tax.

The consolidated trading profit for the year is shown to be £76,886, as against £124,469 for the previous year, and thus shows a decrease of £47,583. Taxation absorbs £35,958 and there is a consolidated net profit of £32,429, as compared with the consolidated net profit of £49,202 for the previous year, a decrease of £16,773.

Trading Conditions

The year's trading has not been as good as one could have desired, but on reflection, considering all the difficulties we have had to face we have come through a difficult period quite well. Our very good name in the trade has stood us in good stead.

I stated last year that the bulk of our raw materals comes from the nationalized industries and we have no option but to accept any increases in prices that are made by those industries. Such increases have been made and these we have met, but unfortunately we were not able to counter these higher costs by increasing the selling prices of our product.

We have had a difficult trading year, as the slight recession we experienced during the latter part of 1953 continued through the early part of 1954. This position was reflected in the main by curtailment of programmes in the agricultural and motor industries and was, in some measure, due to customers working off stocks and reducing order cover.

The effect of this policy was to increase competition and cause a general reduction of prices, in some cases to almost uneconomical levels. Furthermore, every help was given to our customers to assist them in their export markets. It is evident that prices where necessary will require to be brought into line with present-day costs; but, as in the past, this problem will be dealt with fairly and reasonably to ensure no more than a right and proper return for our endeavours.

Of recent months I am pleased to be able to report a substantial improvement in the order position, pressure now being on delivery rather than price, although the margin of net profit on much of the business has been reduced.

Subsidiaries

CHATWINS, LIMITED, produces the very well-known domestic solid-fuel appliances which are sold under the name of "Sunbeam" and have an excellent reputation in the market. There was a slight recession in demand during one part of the year over which we had no control, and resulted in a temporary reduction in output.

J. & J. WHITEHOUSE (TIPTON), LIMITED—Production, under the name of "Phœnix," of a great variety of domestic appliances in cast iron, almost exclusively for export, is made by this subsidiary.

HALE ENAMELLERS, LIMITED—This is a new subsidiary which your directors are developing to enable us to improve upon the enamelling requirements of Chatwins, Ltd., in particular, and also to fill what we feel to be a deficiency in the enamelling market generally.

Current Outlook

Provided we can keep politics out of industry, it would appear as though we can look forward nationally to a good period of prosperity, in which everyone will share; and so long as the £ sterling remains at its present level, *vis-à-vis* the dollar, our prosperity should continue for quite a time. I have no doubt in my own mind that as a nation we are making great material strides, and also advances in better standards of education, which should ultimately enable the man-in-the-street to think more clearly for himself in relation to politics; and what a blessing that really will be, when you realize what has been happening in London's dockland and other important shipping ports! The only thing that arises out of these unfortunate episodes is a measure of impoverishment, and all because certain political factions find it easy to prey on the lack of knowledge of many excellent and humble citizens, who really have no other desire than to live peacefully with their brethren. To use these good people for no other than private political motives is deplorable, but I am sure that as the years go on this nuisance will be seen for what it is worth.

Although it is right and proper for workers to belong to trade organizations which can represent them fairly on all occasions when discussions of terms of employment are involved, nevertheless the abuses of these facilities is getting beyond national endurance, and I am sure that the average working man will end all these abuses of power in his own good time. The established trade union leaders seem altogether scared at the present outlook.

Those of us who can look back over the last half century cannot help but realize what immense strides forward British industry as a whole has made. Not long ago, all that one heard was that British industry could not compete with the foreigner, and neither could it as long as the foreigner was able to maintain his own home market unmolested by tariff walls, while we were constantly being undersold at surplus prices, with the result that there was no solid foundation upon which our manufacturers could build. Since then, but alas much too late, British industry has shown the world what it can do, and I think we can be egotistical enough to suggest that today there is no country in the world to whom we take second place. Our scientific progress enjoys the admiration of the world, and from this progress has arisen our immense production of all kinds of commodities, mostly of the better grades, which the world is eager to have, provided our costs of production remain reasonable.

Our only weakness is where the cheaper "bread and cheese" lines are concerned, in which we are unable to compete very successfully. However, I for one much prefer to see our native skill utilized in the production of higher grades of manufacture in which we excel.

The report was adopted.

Notes from the Branches

Bristol and West of England

In October a party of 85 members and friends of the Bristol and West of England branch of the Institute of British Foundrymen paid an interesting visit to the works and foundries of British Railways at Swindon. Most of the principal departments engaged in the production of items for railway use were visited, and members were able to see the large number of parts used in the construction of locomotives and rolling stock. Much interest was shown in the foundry devoted solely to the production of permanent-way "chairs," but when it was pointed out that four such chairs are required for each yard of track throughout the railway systems of this country, the necessity for such specialized foundries became obvious.

In the foundry sections, items of equipment not normally associated with railways could be seen, examples being components for the pumps of the Severn tunnel and fittings for the lock-gates at one of the South Wales docks operated by British Railways. Members were also conducted around the pattern-, machine-, carriage and erecting-shops, and spent some time in the last department, where locomotives in various stages of construction and reconstruction were to be seen. Many members were surprised at the almost incredible number of parts used in the building of a modern railway locomotive.

At the close of the visit, Mr. D. P. Williams, junior vice-president, thanked the officials of British Railways who had arranged the programme, saying that he felt certain that everyone had enjoyed the visit, had learned much, and would have been ready to spend several more hours making a more detailed tour.

"New Methods for Old"

Later in the same month, a very successful meeting took place, when Mr. F. Hudson gave an interesting talk, preceded by a film entitled "New Methods for Old." Members were shown how improvements could be effected in many non-ferrous foundries by the adoption of modern techniques, very economical to employ, yet capable of increasing and speeding-up foundry output on a scale not anticipated a few years ago. Such subjects—as Mr. Hudson showed both by means of the film and a subsequent talk—included closer control over melting conditions, methods of degasification and the use of exothermic sleeves. The final section of the talk was devoted to increased productivity in the coreshop.

The interest which the film and talk aroused was evident from the number of questions put to Mr. Hudson who, in replying, made the following observations:—

The development of a recognized test similar to the one used in America for assessing the quality of copper-base alloys was very desirable, and the use of a graphite mould would be found to give more consistent results than sand moulds. The steam reaction from the latter could give false values for the gas content of any given material sample. The scavenging of metals with nitrogen was found advantageous in the case of copper/nickel alloys, while the solubility of hydrogen in nickel often permitted the late addition of nickel to a melt. Generally, Mr. Hudson considered that the method of assessing the density of a sample by the specific-gravity method was satisfactory, except in the case of alloys with high lead contents. When using exothermic sleeves, it was considered wise to remove a certain amount of sand in the area of the sleeve to reduce possible blow-back from hard-rammed sand.

In proposing a vote of thanks, Mr. Hollady said that not only were branch members grateful to Mr. Hudson for this particular lecture, but for his untiring interest in the Institute and the foundry industry generally, a tribute which was warmly supported by Mr. D. F. B. Tedds.

Publications Received

Corrosion Preventives. Issued free of charge to applicants by C. C. Wakefield & Company Limited, 46, Grosvenor Street, London, W.1.

Although this 48-page brochure has been produced with the object of increasing sales of the lubricating oils made by the issuing house, it does contain much good information on the general subject of corrosion. In fact, only 10 per cent. of the booklet deals with the application of the firm's own products. It is at least satisfactory to really master the subject germane to their merchandise.

Accidents—How they Happen and How to Prevent them, October, 1954. Published for the Factory Department of the Ministry of Labour and National Service, by H.M. Stationery Office, Kingsway, London, W.C.2, price 1s. net.

A curious accident is reported of an explosion of a wheel-barrow tyre when inflating from a high-pressure air line. It did not occur in a foundry, but might have happened there. The failure to make up a reliable tap-hole between a cupola and a receiver resulted in the whole cupola charge being dropped on to a considerable pool of liquid metal. Modern detective methods established that it was due to faulty workmanship.

Uncommon Clay. Published by the refractories group of the Morgan Crucible Company Limited, Neston, Wirral, Cheshire.

This 52-page well-illustrated, nicely-bound brochure opens with a potted history of Morgan Crucible Company, Limited, and gives a promise of a more detailed survey in 1956, the centenary of the company. This is followed by a description of the formation of the Morgan Refractory Company Limited, and the construction of the works in Cheshire. Thereafter is a collection of excellent photographs covering the processes used. This is an example of modern publicity at its best.

Sweden. Economic and Commercial Conditions in Sweden, by W. G. R. Howell. Published for the Commercial Relations and Exports Department, Board of Trade, by H.M. Stationery Office, York House, Kingsway, London, W.C.2. Price 6s. net.

Foundrymen are well aware of the difficulty in getting reliable statistics about their own industry, but in most cases some sort of a picture can be had by examining tables of statistics. In this book, however, the whole situation is masked by the headings used in the germane table. "Bessemer and Thomas Castings," "Martin Castings" and "Electro Castings" must be a mixture of acid and basic Bessemer and open-hearth and electric steel ingots and castings and maybe iron castings, too. Quite candidly, the presentation seriously impairs the usefulness of the data recorded. A better picture of the Swedish foundry industry is to be gained from the value of Sweden's engineering products as listed in Appendix VII. The economic aspects are competently covered, and much useful information is to be gained from this section.

Personal

MR. THOMAS ALAN SWINDON, an administrative executive of the Aero Division of Rolls-Royce, Limited, Derby, has been appointed assistant to the director of the Allied Employers' National Federation.

MR. J. W. GARDOM was re-elected independent chairman of the Midland Ironfounders' Association at the 16th annual meeting at the Queen's Hotel, Birmingham, recently. MR. W. H. THURSFIELD became vice-chairman.

MR. S. F. FOLLETT has been promoted to chief scientific officer and appointed principal director of research and development (air) at the Ministry of Supply. He is 50 and has been director of instrument research and development since 1950.

BRITISH INSULATED CALLENDER'S CABLES, LIMITED, announce the appointment of MR. P. R. DUNN, B.Sc., M.I.E.E., as Chief Engineer. He succeeds Mr. D. T. Hollingsworth who has recently been appointed to the Board of the Company.

MR. WALTER BARRIE retires by rotation at the end of this year after having held office for two years as chairman of the committee of Lloyd's. He is a director of John Ferguson & Sons (Glasgow), Limited, manufacturers of foundry brushes.

DR. ERNEST S. HEDGES will become director of the International Tin Research Council and director of the Tin Research Institute, following the retirement at the end of this year of MR. JOHN IRELAND. DR. W. E. HOARE, and MR. W. R. LEWIS become assistant directors.

LT.-COL. L. F. URWICK, chairman of Urwick, Orr & Partners, Limited, management and industrial consultants, of London, W.1, is to receive the Wallace Clark International Management Award, which is presented by the Council for International Progress on Management (U.S.A.). Col. Urwick is the first British national to receive the award.

MR. WILLIAM WILKINSON WOOD, whose industrial career has been associated with the Wardsend Steel Company, Limited, Sheffield, which was founded by his grandfather in 1860, and who has sat on the bench of Sheffield City Magistrates since 1937, has been transferred to the supplementary list on reaching the age of 75.

EDGAR ALLEN & COMPANY, LIMITED, announce the retirement of MR. C. PIGOTT, senior draughtsman, trackwork department drawing office, on December 31, 1954. Mr. Pigott has been connected with the firm for over 50 years, and has been responsible for the design of many complicated trackwork layouts, both overseas and in many parts of this country. In this capacity, he has made many surveys and for many years was concerned with the setting-out of trackwork, and supervision of the construction of the finished junctions.

Obituary

We regret to announce the death of MR. F. J. TEBBUTT, who for many years contributed articles to our columns on the impact of legislation on the founding industry.

MR. HOWARD EDWIN PERRY, chairman and managing director of T. & C. Clark, Limited, Shakespeare Foundry, Wolverhampton, died on December 10 at the age of 83. Mr. Perry joined the firm as a director in 1918 and in 1933 succeeded the late Mr. C. H. Iles as chairman and managing director. He was also chairman of Howard E. Perry, Limited, Horseley Field, Wolverhampton.

Air Pollution

Persistently during recent years, and particularly since the coining of the term "smog," has the menace of smoke been impressed upon the community. The problem of air pollution, and the steps now being taken to overcome it, are illustrated in the latest sound film, "Guilty Chimneys," produced by Associated British-Pathe, Limited, for the Gas Council. Although some of the shots are very impressive, it is rather a disappointing film, technically, as it seems to confuse the issue.

To the man in his street, chimneys emitting little or no black smoke are excellent; but it does not follow that no fumes are polluting the atmosphere, with danger to the community and also to the masonry of public buildings. However, smoke does show that fuel is being burnt inefficiently.

To burn more smokeless fuels, such as coke, as encouraged by the film, may help extensively towards greater efficiency and economy, but the question of the damaging sulphur gases is still present, as it is with other fuels. Still, the case against smoke pollution is well shown in the film, which dramatically illustrates how part of one of Britain's most precious mineral assets, which should be used to increase the nation's wealth, is allowed to escape into the air to do harm instead of good. The film, which is in black and white, runs for 22 min., and is available on 16 mm. and 35 mm. Its main theme is to emphasize the need to economize in fuel and secure its more efficient burning.

Iron and Steel Output Records

Last month's steel production reached a new high level, averaging 377,000 tons a week, which exceeds the previous highest output of 374,500 tons a week which was achieved in both May and October of this year.

The Iron and Steel Board also announced on Wednesday that last month's pig-iron production, which averaged 235,300 tons a week, was higher than in any previous month.

Latest steel and pig-iron output figures compare as follow with earlier returns:—

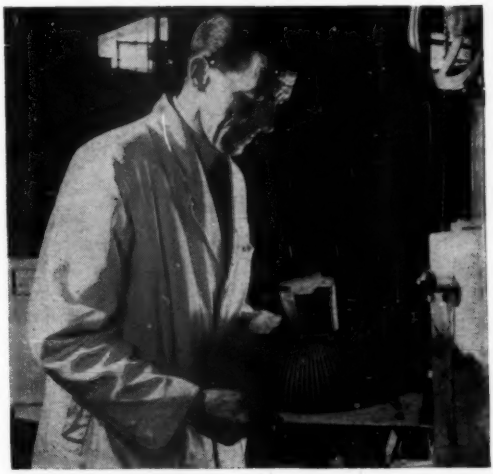
Period.	Pig-iron.		Steel ingots and castings.	
	Weekly average.	Annual rate.	Weekly average.	Annual rate.
	Tons.	Tons.	Tons.	Tons.
1954—September ..	222,900	11,591,000	372,300	19,358,000
October ..	230,700	11,998,000	374,500	19,472,000
November ..	235,300	12,236,000	377,000	19,606,000
1953—September ..	213,900	11,123,000	346,500	18,019,000
October ..	221,500	11,519,000	355,000	18,460,000
November ..	228,500	11,883,000	363,000	18,878,000

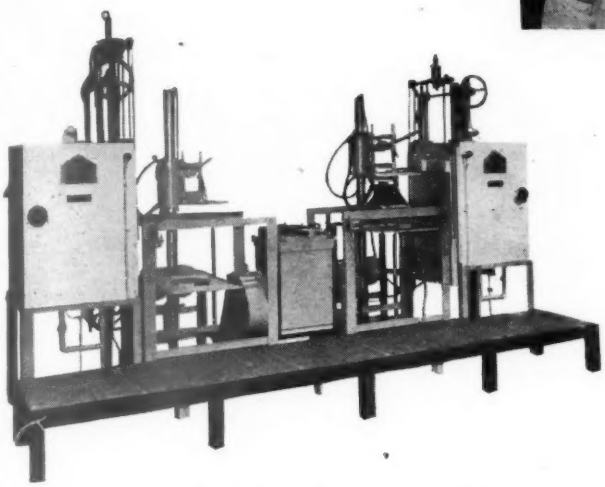
Trade of the Tees

Inwards and outwards traffic handled at the Tees ports during the 12 months ended October 31 amounted to 6,191,082 tons—the highest figure ever reached in the history of the river. The revenue of £337,082 for the 12 months was also a record. Imports of iron ore reached a total of 2,947,647 tons, iron and steel imports attained 374,479 tons, and coal and coke 650,869 tons. Exports included 453,926 tons of iron and steel and coal cargoes amounting to 357,367 tons, the latter figure representing an increase of 96,055 tons on the exports for the previous 12 months.

Shell Moulding in 3D

The Shelmolda 'Altus' will handle patterns up to 13in. in height or depth and therefore will provide a greater variety of sand/resin moulds than any other machine on the British market. All the main operations are carried out mechanically and the minimum of physical effort is required from the operator.





The Shelmolda "Altus" (patent applied for)

Capacity

Effective pattern plate sizes of 16in. by 16in. and 16in. by 12in. Handles pattern plates 13in. high or 13in. deep in each oven. Will produce from split pattern 26in. overall. Oven opening adjustable up to 16in. above or below centre line.

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236/72

News in Brief

A SMOKELESS ZONE will be declared in the centre of Nottingham within the next three years, according to the city's medical officer of health.

A VACANT FACTORY on the Pallion trading estate, Sunderland, is to be taken over by Thorn Electrical Industries, Limited, Enfield (Middx), early in the New Year.

PRODUCTION of Tunisian iron ore in the first eight months of this year was 625,262 tons. Of exports totalling 584,631 tons, 75.93 per cent. went to the United Kingdom.

AT THE END OF OCTOBER, the number of persons in civil employment (industry, commerce and services of all kinds) was 22,630,000, nearly 20,000 more than at the end of September.

THE BRITISH TRANSPORT COMMISSION announce that a contract has been placed with the Tees-side Bridge and Engineering Works, Limited, Middlesbrough, for three hundred 42-ton bogie bolster wagons.

NO GOODS will be received or despatched by Bruce Peebles & Company, Limited, engineers, of Edinburgh, during the New Year holiday, when the works will be closed from December 31 until January 6.

FURTHER WORKS EXTENSIONS at Hebburn-on-Tyne are planned for A. Reyrolle & Company, Limited, switchgear makers, etc. It is understood that the proposals involve land at present used for council allotments.

MORE THAN 400 employees and guests and 200 children attended a Christmas party at the Town Hall, Uttoxeter, arranged by the sports club of Bamfords Limited, agricultural engineers and founders, of Uttoxeter.

BIRMINGHAM ALUMINIUM CASTING (1903) COMPANY, LIMITED, one of the Birmid Industries group, have leased a three-acre site at Brownhills, in the area which the local Urban District Council has zoned as an industrial site.

THE FIRST annual dinner, of Arthur Green, Limited, ironfounders, Old Whittington, Chesterfield, was held at the Hotel Portland. Tributes were paid to the work of the directors and employees, and gold watches were presented to four long-service employees.

STEELWORKS in the Motherwell area of Colvilles, Limited, and the Lanarkshire Steel Company, Limited, will close for the New Year holiday on December 30 and resume on January 4. Formerly the steelworkers had two weeks' holiday at the New Year.

SPUN-IRON PIPES, special castings, and flexible joints worth over $1,000,000 have been ordered by the Government of Venezuela from the Stanton Ironworks Company, Limited. The pipes are required for water distribution and range from 100 mm. to 500 mm. dia.

ACCORDING to a paper sent us by the Department of Scientific Research, entitled "Productivity, Fuel Availability, and its Effective Use," by Mr. K. T. Spencer, the best and worst yields of bronze and brass castings per ton of coal consumed were 2.5 tons and 0.2 tons.

GOOD RESULTS have been obtained by Augusts, Limited, of Halifax, through their showing of the August Simpson mix/muller at the third *Salon de la Chemie et des Matières Plastiques*, an exhibition covering the chemical and plastics industry, recently held in Paris.

THE COLLEGE OF TECHNOLOGY, BIRMINGHAM, is offering a course of ten lectures on powder metallurgy, by Mr. J. F. C. Morden, B.Sc., A.I.M. The course starts at 10 a.m. on successive Saturdays mornings, beginning on January 8, 1955. The fee for the whole course is two guineas and applications to participate should be addressed to the Registrar.

GEM BRUSHES (LUSON), LIMITED, Standard Road, Park Royal, London, N.W.10, have acquired the business of the Kingswood Manufacturing Company, Limited, Letchworth, Herts. A third factory at Minerva Road, Park Royal, has also been recently acquired, to take care of increasing business and to house a research department.

A COPY of the Ringelmann Smoke Chart, together with instructions for its use, has been received from Charles Griffin & Company, Limited, 42, Drury Lane, London, W.C.2. The demand for these charts has assumed increasing importance in view of the (Beaver) Report on Air Pollution. The chart costs 1s. 6d. for 3 copies—with reductions for greater quantities.

THE ANNUAL DINNER of the Southern section of the Institute of Vitreous Enamellers will be held on Friday, January 14, 1955, at 7.15 for 7.30 p.m. in The White Horse Restaurant, Birmingham. Applications for tickets (price 13s. 6d. each) should be addressed before January 5 to the honorary secretary, Mr. D. Sleath, c/o Borax Consolidated Limited, 87 to 89, Edmund Street, Birmingham 3.

ROTHERHAM COLLEGE of Technology is to introduce a course for iron and steel operatives in the New Year which is said to revolutionize training in its field and will be of national importance. The College will also have candidates for the final-grade certificate in furnace brickwork which the City and Guilds are providing in 1956. The College gave a lead by starting a course on furnace brickwork two or three years ago.

AT THE North Staffordshire Technical College, Stoke-on-Trent, a series of 12 specialist lectures on production of vitreous-enamelled ware is being organized. As with those held last year, the lectures are open to the industry in general. The fee for the course is two guineas, and the lectures will be held on Tuesdays from 5.15 to 6.30 p.m., commencing on January 4, 1955, and finishing on March 22. Those interested should make application to the Principal of the College.

NARESCO EQUIPMENT CORPORATION, of 160, Charlemont Street, Newton Highlands 61, Massachusetts, U.S.A., are marketing a new, 30-lb. capacity induction-heated vacuum furnace. Available with either a vertical or horizontal shell, it is a self-contained furnace for research and development purposes. Amongst unique features claimed are a co-axial power input and means for adding additional charge material or alloying material during melting without losing the vacuum.

UNDER A SCHEME announced by the Coal Utilisation Council on December 13, householders and tenants will be able to obtain the latest fires, stoves, cookers, and other improved domestic solid-fuel appliances on easy payment terms. The C.U.C. has arranged with the Mercantile Credit Company, Limited, for credit facilities to be available to members of the Council's panel of authorized distributors, and the public will be able to pay for a new appliance over a period of two years or less.

(*Continued on page* 764)

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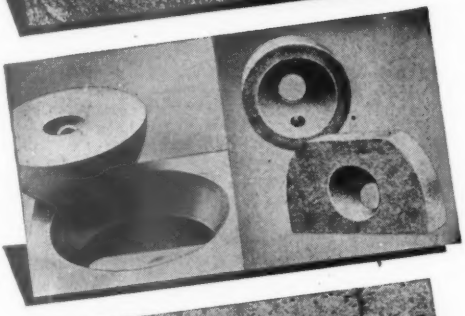

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A finely ground air setting cement for jointing all types of firebricks. Supplied dry. Special characteristics include:—produces thin and strong joints: negligible shrinkage: highly refractory: economical in use. Maximum service temperature 1650°C.

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News in Brief

(*Continued from page 762*)

THE FIRST foundry dinner of Aga Heat, Limited, Ketley, Salop, was held recently in the works canteen. Mr. A. Price, assistant works manager, presided and Mr. C. Coop, works manager, proposed a toast to the visitors, the response being made by Mr. Elliott, managing director from the firm's London office. A presentation of a silver tea-set was made by Mr. Ben Lewis, on behalf of the employees, to Mr. A. Sykes on his appointment as managing-director of Allied Ironfounders, Limited, (Midland Group).

OVER 90 per cent. of the exhibitors at the 1954 Scottish Industries Exhibition at the Kelvin Hall, Glasgow, reported that they considered the venture worth while, and business done is regarded as being in excess of £10 million. The Exhibition, which is backed by a guarantee fund and draws no subsidy whatever, is expected to show a surplus of approximately £11,000. It has not yet been decided when the next exhibition will be held, but it is likely that an interval of a few years will be allowed to lapse.

MR. HUGH MCDERMOTT, service engineer of Incandescent Heat Company, Limited, Smethwick, has left for the Montreal works of the Canadian Car & Foundry Company, Limited, to supervise the installation of the £17,000 heat-treatment plant which his company has made. The contract for the plant, which will harden the steel of couplings for 100 railway cars a day, was won in the face of keen American competition. The plant has an oil-fired furnace and to ship it the furnace was dismantled into sections.

JULES WEITZ tower-cranes will soon be in production at the Chesterfield Works of Sheepbridge Equipment, Limited, a subsidiary of Sheepbridge Engineering, Limited, the parent company, having secured the licence. These mobile electric tower-cranes, it is claimed, can be rapidly dismantled, transported and re-erected. They have the advantage of being able to "spot place" loads of concrete, bricks, or other building materials, from ground level to points many storeys high in a matter of seconds, enabling contractors to cut handling costs.

BIRMINGHAM SMALL ARMS COMPANY, LIMITED, have planned a scheme of works modernization and development for the steel and tool-making subsidiaries—William Jessop & Sons, Limited, Brightside Works, Sheffield, and J. J. Saville & Company, Limited, Triumph Steel Works, Sheffield. The chairman, Sir Bernard Docker, told shareholders at the annual meeting on December 10 that the scheme would cover a considerable period and would be launched section by section as engineering and other facilities allowed. Outlay on new plant will be substantial.

SHEFFIELD INDUSTRY has made "a most ready response" to the University's appeal for annual subscriptions towards the running expenses of the departments of engineering and metallurgy, said the treasurer, Mr. W. H. Olivier, at the annual meeting of the University Court earlier this month. "Up to date," he said, "120 firms have sent contributions, totalling £17,000," and there was no reason to suppose that it was a final figure. Each of the contributors had expressed a desire to continue to contribute in future years, provided trade conditions remained favourable.

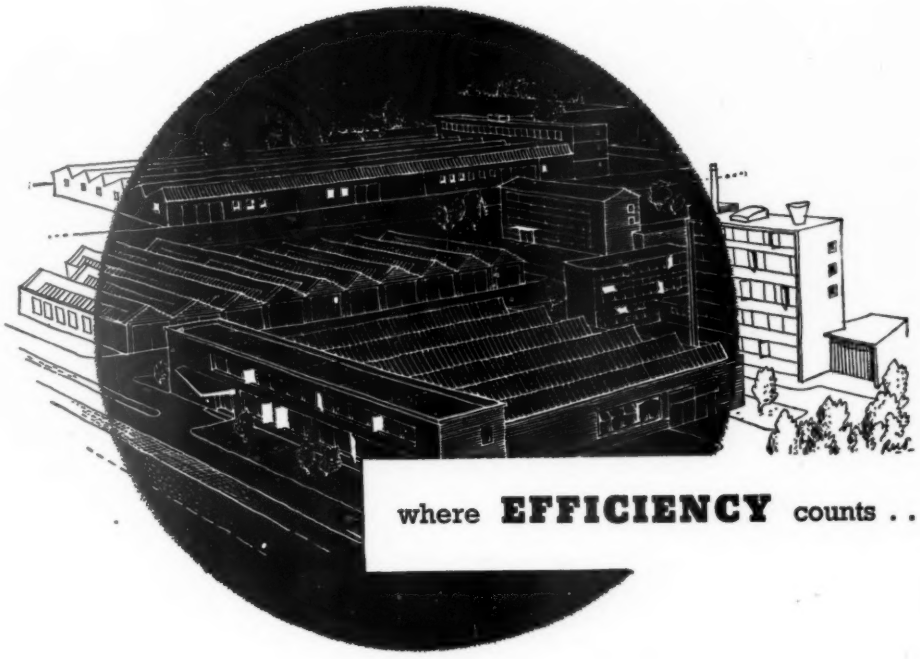
A GUEST at the annual general meeting of the Wolverhampton Die Casting Company, Limited, in Wolverhampton on December 8 was Mr. Jas. M. Hutton, director of research of the Precision Castings Company, Incorporated, of U.S.A., who acts as the Wolverhampton firm's liaison officer with America. Mr. Hutton brought greetings from his president, Mr. M. W. J. During, who is also president of the American Die Casting Institute. Mr. During, he said, had followed keenly and with admiration the Wolverhampton company's handling of a complex manufacturing business. Mr. Hutton, who is also a director of Lucas Electrical Services in the U.S.A., has crossed the Atlantic 64 times.

TRADE, COMMERCIAL and consular representatives of 21 countries met at the Birmingham Exchange and Engineering Centre on December 9 to discuss the increase of trade between their countries and Britain. Speaking at a luncheon given to the delegates by officials of the Centre, Mr. C. J. Grazebrook, president, stressed the help they could give in solving problems and said that the Centre was being developed as a meeting place for engineers from all over the world. It was going all out to encourage export, and particularly wanted to encourage the small and medium-size firms to export their products. The Centre's task was to put foreign buyers in touch with the smaller firms and, later, it was hoped that the market research in other countries could be conducted on their behalf.

STERLING METALS, LIMITED, Coventry, one of the Birmid Industries group, recently held a "safe-handling week," one of the features of which was an exhibition of safety equipment, and of damaged and dangerous handling-appliances—including a suit of armour, labelled "the earliest form of protective equipment"! Talks during lunch-hour breaks by executives of the Company and a trade-union organizer; slogan and suggestion competitions were other events of the week. Mr. George Hickling of the Central Council of Physical Recreation demonstrated manual lifting and handling methods. During the week, a reduction in handling accidents was achieved, there being only 25 compared with an average of 36.9 per week in 1953.

BECAUSE of the restrictions (previously reported in these columns) imposed by the Aldridge Urban District Council Planning Committee, Castings, Limited, have decided to move the site of their projected £100,000 extension factory from Aldridge to Brownhills; they eventually intend to employ up to 250 there. Aldridge Urban Council had attempted to impose on the firm conditions concerning the possible emission of smoke, grit, or fumes from the premises. The firm's action was taken following representations of the Council of Ironfoundry Associations. After considering the firm's case, the C.F.A., advised its members not to sign covenants with local Councils where considerable expenditure might be required if the terms relating to smoke, dust, etc., were strictly adhered to. It is expected the new factory will begin production in 1956, with a staff of about 80.

THE INTRODUCTION of a new "prize" scheme for apprentices of the Wednesbury foundry and engineering works of F. H. Lloyd & Company, Limited, was announced this month by the firm's works director, Mr. M. C. Lloyd. The prize is a scholarship which will enable the most proficient all-round apprentice of the year to go to America for six months. Making the announcement at the annual apprentices' prize distribution, Mr. Lloyd said that negotiations with the American firm of excavator manufacturers, Bucyrus Erie, had been going on for some time. It had now been agreed that the selected apprentice should spend six months in America gaining experience at the American company's foundry and that during his stay he should "learn, see, travel and live in an American home all at the expense of the company." Earlier, a total of 45 apprentices had been presented with cash, books and tools, as prizes.



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Raw Material Markets

Iron and Steel

Although most foundries will be closed for the Christmas holiday from Friday until Wednesday, deliveries of pig-iron and other raw materials are not being suspended during that period, foundrymen being anxious to have stocks available for the resumption of work. This applies particularly to the engineering and speciality foundries, which are very short of the low- and medium-phosphorus irons. A few of these foundries have utilized their allocation up to the end of the year and have been compelled to seek additional supplies of hematite and also the refined grades of pig-iron. They have plenty of work on hand, with good support forthcoming from the motor and allied trades, electrical and power-plant equipment makers, and the machine-tool and other trades.

Business at the light foundries continues to show slight improvement, which has had the effect of increasing demands for high-phosphorus pig-iron. The jobbing foundries are busy. The supply of high-phosphorus iron is not too plentiful, while it has been difficult recently to obtain high-silicon irons from some producers.

Scrap supplies are generally sufficient for current needs. Foundry coke supplies are, in the main, up to allocated quantities, and consumers of ganister, limestone, and firebricks continue to experience no difficulty.

Many re-rollers are finding it difficult to obtain sufficient supplies of steel semis to meet current production needs. Practically all stocks have been used up and deliveries from home steelworks continue to fall off. The present ingot production at the steelworks appears to be totally inadequate to satisfy fully the needs of both the steelworks and the re-rollers. The products of the re-rollers are in strong demand and most of the re-rolling mills are committed for their outputs for some months ahead.

Non-ferrous Metals

The ratification of the international tin agreement negotiated in Geneva at the end of last year was signed by Sir Anthony Eden on behalf the United Kingdom last week. The same document signified the separate participation in the agreement of Nigeria and Malaya. While previously only Australia, Canada, and Denmark had ratified the agreement, it is believed that the other signatories to the draft are waiting only upon constitutional processes.

Figures published by the British Bureau of Non-Ferrous Metal Statistics show that in October consumption of tin in the U.K., at 1,790 tons, dropped below the September figure of 2,034 tons. Stocks in the month also fell, however, to 4,425 tons, against 4,657 tons at the end of September. Copper stocks at the end of October declined by 10,782 tons on the September figure of 72,266 tons.

There was also an appreciable fall in lead stocks. At the end of October there were 22,269 tons in stock, compared with 28,958 tons at the end of September. While consumption was only slightly lower in October, production showed an increase, at 7,988 tons, of 632 tons on September's output. In zinc, consumption fell to 28,543 tons during October, which compared with 30,413 tons in September. Stocks also fell, the end-October figure of 44,611 tons comparing with 47,314 tons at the end of September.

In general, all the markets were steady last week and the quiet tone evident before the Christmas holiday seemed to have set in. On Monday, however, tin slumped below £700 for both positions by the end of the morning session.

Official metal prices were as follow:—

COPPER, Standard—*Cash:* December 15, £279 to £280; December 16, £279 10s. to £279 15s.; December 17, £281 to £282; December 20, £282 to £282 10s.

Three Months: December 15, £267 to £267 10s.; December 16, £266 to £266 10s.; December 17, £266 10s. to £267; December 20, £268 to £268 10s.

TIN, Standard—*Cash:* December 15, £712 10s. to £713; December 16, £711 10s. to £712; December 17, £709 10s. to £710; December 20, £691 10s. to £692 10s.

Three Months: December 15, £712 10s. to £713; December 16, £711 10s. to £712; December 17, £710 to £710 10s.; December 20, £692 10s. to £693 10s.

ZINC—*First half December:* December 15, £83 to £83 5s. *Second half December:* December 16, £82 15s. to £83; December 17, £82 to £82 10s.; December 20, £81 15s. to £82 5s.

First half March: December 15, £82 5s. to £82 10s. *Second half March:* December 16, £82 to £82 5s.; December 17, £81 15s. to £82; December 20, £81 15s. to £82.

LEAD—*First half December:* December 15, £103 5s. to £103 10s. *Second half December:* December 16, £103 5s. to £103 10s.; December 17, £103 5s. to £103 10s.; December 20, £103 5s. to £103 10s.

First half March: December 15, £103 to £103 5s. *Second half March:* December 16, £102 15s. to £103; December 17, £102 10s. to £103; December 20, £102 10s. to £102 15s.

Correspondence

"SOAKING" THE FOUNDERS

To the Editor of the FOUNDRY TRADE JOURNAL.

SIR,—Ironfounders generally will be in full agreement with the comments made in your leading article of December 9 last, except for the very unfortunate statement regarding the average cost increase. The figure quoted is totally inaccurate in all ranges of cast-iron products, whether made from an all-scrap mixture, or from any variety of pig and scrap mixtures up to 100 per cent. pig-iron charges.

Careful estimates, based on the increased cost of pig-iron, scrap iron, scrap metal, and coke, announced this month, show that the minimum increase in cost is 15s. per ton, and that for high-quality castings using refined irons or a high percentage of steel scrap, the increase will be well over 20s. per ton.

Many ironfounders have already been carrying an increased cost of pig-iron ranging from 7s. 6d. to 15s. per ton, announced on May 31, together with an average increased cost of 18s. 6d. per ton on foundry coke, so that the cumulative additional costs since May 31 range from 25s. per ton to 50s. per ton, depending upon the type of iron charged into the cupola.

Under these circumstances, a statement that the average cost increase per ton of iron castings will be of the order of 6s. 3d. per ton is very harmful, and will increase the ironfounders' difficulty in negotiating an increased price which is at all commensurate with his increased costs.—Yours, etc.,

MANN, JUDD & COMPANY.
Secretaries.

National Ironfounding Employers' Federation,
8, Frederick's Place, Old Jewry,
London, E.C.2.
December 16, 1954.

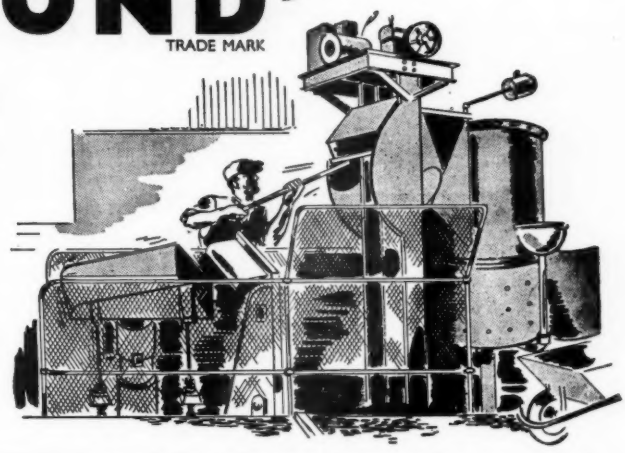
[The figure quoted was an obvious error and was corrected in our last issue.—EDITOR.]

'FULBOND'

TRADE MARK

for quick bond development

'FULBOND' develops its bond so rapidly that foundrymen can reduce milling time and increase the output of their sand mills.



For service and information write to:—

THE FULLERS' EARTH UNION LTD.

Patteson Court, Redhill, Surrey. Tel: Redhill 3521

C.H.F. 13

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GUNMETAL-PHOSPHOR BRONZE

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Chronicle Buildings, Corporation Street, Manchester 4. Tel. Blackfriars 3741

Powell Duffryn House, Adelaide Street, Swansea. Tel. Swansea 4035

Current Prices of Iron, Steel, and Non-ferrous Metals

(Delivered unless otherwise stated)

December 20, 1954

PIG-IRON

Foundry Iron.—No. 3 IRON, CLASS 2:—Middlesbrough, £15 12s. 0d.; Birmingham, £15 5s. 3d.

Low-phosphorus Iron.—Over 0.10 to 0.75 per cent. P, £17 13s. 9d., delivered Birmingham. Staffordshire blast-furnace low-phosphorus foundry iron (0.10 to 0.50 per cent. P, up to 3 per cent. Si), d/d within 60 miles of Stafford, £18 9s. 3d.

Scotch Iron.—No. 3 foundry, £18 2s. 3d., d/d Grangemouth.

Cylinder and Refined Irons.—North Zone, £20 4s. 0d.; South Zone, £20 6s. 6d.

Refined Malleable.—P, 0.10 per cent. max.—North Zone, £21 1s. 6d.; South Zone, £21 4s. 0d.

Hematite.—Si up to 2 per cent., S. & P. over 0.03 to 0.05 per cent.:—N.-E. of England (local iron), £18 2s. 6d.; Scotland (Scotch iron), £18 9s. 0d.; Sheffield, £19 7s. 6d.; Birmingham, £19 14s. 6d.; Wales (Welsh iron), £18 9s. 0d.

Basic Pig-iron.—£15 15s. 6d. all districts.

FERRO-ALLOYS

(Per ton unless otherwise stated, delivered)

Ferro-silicon (6-ton lots).—40/55 per cent., £42 0s. 0d., basis 45 per cent. Si, scale 17s. per unit; 70/84 per cent., £65 0s. 0d., basis 75 per cent. Si, scale 18s. per unit.

Ferro-vanadium.—50/60 per cent., 23s. 8d. to 25s. 0d. per lb. of V.

Ferro-molybdenum.—65/75 per cent., carbon-free, 10s. 6d. per lb. of Mo.

Ferro-titanium.—20/25 per cent., carbon-free, £185 0s. 0d. to £195 0s. 0d. per ton; 38/40 per cent., £251 0s. 0d. to £270 0s. 0d. per ton.

Ferro-tungsten.—80/85 per cent., 14s. 0d. per lb. of W.

Tungsten Metal Powder.—98/99 per cent., 17s. 0d. per lb. of W.

Ferro-chrome (6-ton lots).—4/6 per cent. C, £75 0s. 0d. to £80 0s. 0d., basis 60 per cent. Cr, scale 25s. 0d. per unit; over 6 per cent. C, £74 0s. 0d. to £76 0s. 0d., basis 60 per cent. Cr, scale 24s. 0d. per unit; 2 per cent. C,* 1s. 7½d. per lb. Cr; 1 per cent. C,* 1s. 8d. per lb. Cr; 0.15 per cent. C,* 1s. 9½d. per lb. Cr; 0.10 per cent. C,* 1s. 9¾d. per lb. Cr; 0.06 per cent. C,* 1s. 10d. per lb. Cr.

Metallic Chromium.—98/99 per cent., 6s. 6½d. to 7s. 1d. per lb.

Metallic Manganese.—93/95 per cent., carbon-free, £225 0s. 0d. to £232 0s. 0d. per ton; 96/98 per cent., £255 0s. 0d. to £262 0s. 0d. per ton.

Ferro-columbium.—60/75 per cent., Nb + Ta, 52s. 6d. to 70s. 0d. per lb., Nb + Ta.

Ferro-manganese (home).—78 per cent., £54 15s. 0d.

SEMI-FINISHED STEEL

Re-rolling Billets, Blooms, and Slabs.—BASIC: Soft, u.t., £25 5s. 0d.; tested, 0.08 to 0.25 per cent. C, £26 5s. 0d.; hard (0.41 to 0.60 per cent. C), £27 10s. 0d.; silico-manganese, £34 10s. 0d.; free-cutting, £29 6s. 6d. SIEMENS MARTIN ACID: Up to 0.25 per cent. C, £32 17s. 0d.; silico-manganese, £34 10s. 0d.

* Average 68-70 per cent. Cr.

Billets, Blooms, and Slabs for Forging and Stamping.—Basic, soft, up to 0.25 per cent. C, £29 13s. 6d.; basic, hard, over 0.41 up to 0.60 per cent., C, £30 16s. 0d.; acid, up to 0.25 per cent. C, £33 15s. 0d.

FINISHED STEEL

Heavy Plates and Sections.—Ship plates (N.-E. Coast), £31 1s. 6d.; boiler plates (N.-E. Coast), £33 11s. 6d.; floor plates (N.-E. Coast), £32 10s. 6d.; sectional material, N.-E. Coast, £29 4s. 6d.

Small Bars, Sheets, etc.—Rounds and squares, under 3 in., untested, £31 19s. 6d.; flats, 5 in. wide and under, £31 19s. 6d.; hoop and strip, £33 1s. 6d.; uncoated strip mill coils, hot rolled, under 3mm. to 12g., £34 5s. 0d.; black sheets (hand mill), 17/20 g., £43 13s. 6d.; galvanized corrugated sheets, 24 g., £54 10s. 0d.

Alloy Steel Bars.—1 in. dia. and up: Nickel, £54 7s. 9d.; nickel-chrome, £76 7s. 9d.; nickel-chrome-molybdenum, £86 8s. 6d.

NON-FERROUS METALS

Copper.—Cash, £282 0s. 0d. to £282 10s. 0d.; three months, £268 0s. 0d. to £268 10s. 0d.; settlement, £282 10s. 0d.

Copper Tubes, etc.—Solid-drawn tubes, 33d. per lb.; wire, 320s. 6d. per cwt. basis; 20 s.w.g., 351s. 9d. per cwt.

Tin.—Cash, £691 10s. 0d. to £692 10s. 0d.; three months, £692 10s. 0d. to £693 10s. 0d.; settlement, £692 10s. 0d.

Zinc.—Second half December, £81 15s. 0d. to £82 5s. 0d.; second half March, £81 15s. 0d. to £82 0s. 0d.

Zinc Sheets, etc.—Sheets, 15 g. and thicker, all English destinations, £112 15s. 0d.; rolled zinc (boiler plates), all English destinations, £110 5s. 0d.; zinc oxide (Red Seal), d/d buyers' premises, £96 0s. 0d.

Lead (Refined Pig).—Second half December, £103 5s. 0d. to £103 10s. 0d.; second half March, £102 10s. 0d. to £102 15s. 0d.

Brass Tubes, etc.—Solid-drawn tubes, 26½d. per lb.; rods, drawn, 35⅞d.; sheets to 10 w.g., 291s. 0d. per cwt.; wire, 33⅝d.; rolled metal, 277s. 3d. per cwt.

Brass (Brazing).—BS1400, B3 (65/35), £186; B6 (85/15), £235; BS249, £190.

Brass (High Tensile).—BS1400, HTB1 (30 tons), £220; HTB2 (30 tons), £230; HTB3 (48 tons), £241.

Gunmetal.—RCH, 3/4 per cent. tin, —; BS1400, LG2 (85/5/5/5), £237; LG3 (86/7/5/2), £245; G1 (88/10/2/½), £311; (88/10/2/1), £300.

Phosphor Bronze.—BS1400, PB1 (AID released), £320 per ton.

Phosphor Bronze Strip, etc.—Strip, 409s. 9d. per cwt.; sheets to 10 w.g., 432s. 3d. per cwt.; wire, 50½d. per lb.; rods, 44d.; tubes, 42½d.; chill cast bars: solids 44d., cored 45d. (CHARLES CLIFFORD, LIMITED.)

Nickel Silver, etc.—Rolled metal, 3 in. to 9 in. wide × 0.056. 3s. 5½d. per lb.; round wire, 10g. in coils (10 per cent.), 3s. 11d.; special quality turning rod, 10 per cent., ½ in. dia., in straight lengths, 3s. 10d. All prices are net.

Other Metals.—Magnesium, ingots, 2s. 3d. per lb. Antimony, English, 99 per cent., £210 0s. 0d. Quicksilver, ex-warehouse, £110 0s. 0d. Nickel, £519 0s. 0d. Aluminium, ingots, £156 0s. 0d.; aluminium bronze (BS1400), AB1, £283; AB2, £295. Solder, brazing, BS1845, 2s. 3d. lb.; granulated, 2s. 6d. lb.

Company News

JOHN FOWLER & COMPANY (LEEDS), LIMITED, makers of crawler tractors and locomotives—The company is raising its dividend from 20 per cent. to 25 per cent., less tax, for the year to September 30.

HOWARD & BULLOUGH (SECURITIES), LIMITED—An interim dividend is announced of 70 per cent., payable on the £1,250,000 ordinary capital, nearly all of which was recently acquired by Singer & Friedlander, merchant bankers. For the previous year, to March 31, 1954, there was a single payment of 8½ per cent.

H. J. ENTHOVEN & SONS, LIMITED, lead smelters and refiners, etc., of London, E.C.4—Arrangements have been made for a placing, without quotation, of £100,000 4½ per cent. first mortgage debenture stock, 1961-64, at a price of 99. The new stock will rank *pari passu* with the £150,000 of 1½ per cent. stock already in issue.

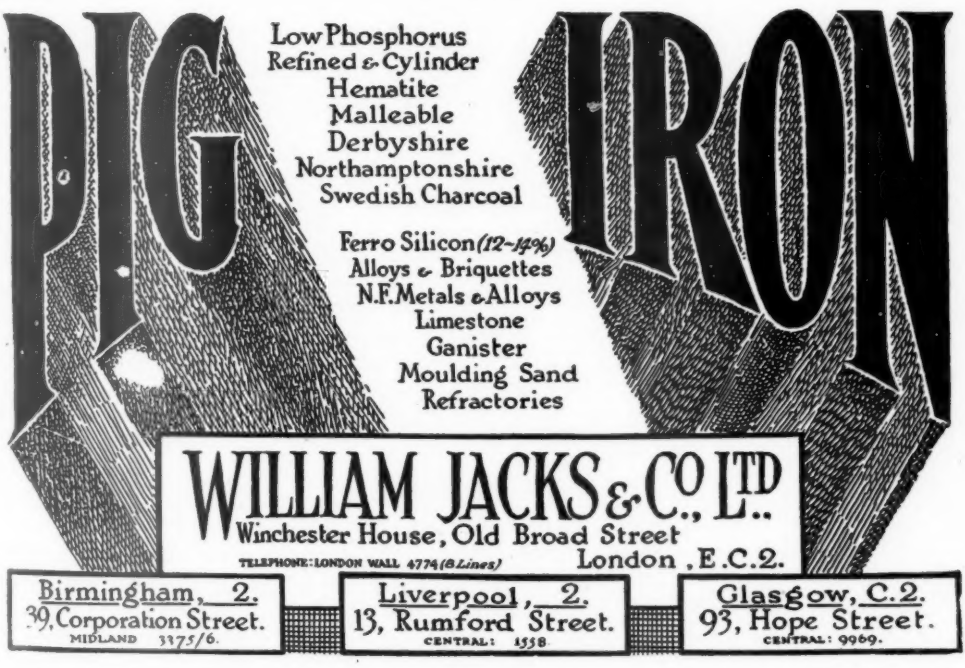
MARSHALL, SONS & COMPANY, LIMITED, engineers, Gainsborough, and holders of the entire ordinary-share capital of John Fowler & Company (Leeds), Limited, are to pay a dividend of 15 per cent. for the year ended September last. Net profits have increased by £12,000 to £147,000 and the dividend is covered about 2½ times.

LAKE & ELLIOT, LIMITED, engineers and steel-founders, of Braintree (Essex)—The board recommends a final dividend of 7½ per cent., less tax, on the 600,000 ordinary 10s. shares. This follows an interim of 5 per cent. on 300,000 shares, which were increased in July by a one-for-one scrip issue. Last year 12½ per cent. was paid on the smaller capital. The net profit amounts to £126,479, compared with £108,112. Appropriation to reserve for enhanced replacement costs is £25,000, compared with £36,875.

ENGLISH ELECTRIC COMPANY, LIMITED—The directors announce that £18,300 (nominal) 4 per cent. debenture stock 1965-85 was drawn on December 7 for redemption. The redemption will be effected at par on January 31, 1955. Accordingly, after taking the redemption into account, with sundry purchases amounting to £30,121 stock on the market, the outstanding 4 per cent. debenture stock 1965-85 of the company will, after January 31, 1955, amount to £2,772,140.

BILSTON FOUNDRIES, LIMITED—The directors recommend the issue of one new 2s. ordinary share for every two 2s. existing ordinary shares held by way of capitalization of £70,000 from the balance at credit of general reserve, such new shares to rank *pari passu*, but they will not participate in the interim dividend now announced. The consent of the Capital Issues Committee has been obtained. The directors also recommend the increase of the authorized capital to £350,000 by the creation of 1,500,000 ordinary shares of 2s. each.

ELECTRIC FURNACE COMPANY, LIMITED—The directors propose a scrip issue of 33,313 5½ per cent. £1 cumulative preference shares to preference shareholders and to convert the existing 7 per cent. cumulative preference into 5½ per cent. £1 cumulative preference shares. The directors also propose making a bonus issue of 156,500 £1 ordinary shares to ordinary shareholders in the proportion of one new share for every one held. The revised nominal capital, therefore, will be £500,000 divided into 155,456 5½ per cent. cumulative preference shares of £1 each, and 313,000 ordinary shares of £1 each. The balance of 31,544 will be unclassified shares and, at the moment, unissued.



CLASSIFIED ADVERTISEMENTS

PREPAID RATES: Twenty words for 5s. (minimum charge) and 2d. per word thereafter. Box Numbers 2s. extra (including postage of replies).

Advertisements (accompanied by a remittance) and replies to Box Numbers should be addressed to the Advertisement Manager, Foundry Trade Journal, John Adam House, 17/19, John Adam Street, Adelphi, London, W.C.2. If received by first post Tuesday advertisements can normally be accommodated in the following Thursday's issue.

SITUATIONS VACANT

The engagement of persons answering these advertisements must be made through a Local Office of the Ministry of Labour or a Scheduled Employment Agency if the applicant is a man aged 18-64 inclusive or a woman aged 18-59 inclusive unless he or she, or the employment, is excepted from the provisions of the Notification of Vacancies Order, 1952.

SENTINEL (SHREWSBURY), LTD., thank those who applied for the position of Foundry Manager, and advise them that the vacancy has now been filled.

LABORATORY ASSISTANT (male). Some experience of Foundry or Laboratory work desirable, but not essential. Good pay and prospects.—Apply BRITANNIA IRON & STEEL WORKS, LTD., Bedford.

WORKS ENGINEER.—A vacancy exists in a well-established Midland Ironfoundry for a Works Engineer. Applicants should have had experience with all classes of foundry plant, plant records, and factory regulations. Please apply, stating age, experience, and salary required, Box WE953, FOUNDRY TRADE JOURNAL.

A VACANCY exists for a FOUNDRY SUPERINTENDENT in a Ferrous and Non-ferrous Foundry in East Anglia. Applications are invited from experienced Foremen who feel they can handle a labour force of 60-70. The position will be progressive as expansion is intended.—Box AV954, FOUNDRY TRADE JOURNAL.

IRONMOULDERS for loose pattern medium and heavy work. Top rates.—Apply F. H. CLARK & SON, LTD., Sutherland Road, Blackhorse Lane, Walthamstow, E.17.

C. A. PARSONS & CO., LTD., Heaton Works, Newcastle-on-Tyne: ASSISTANT IRON FOUNDRY MANAGER. Applications are invited for the post of Assistant Manager, Foundry Department. The Foundry, which has been recently re-equipped, employs approximately 250 men. It handles iron castings up to 30 tons and non-ferrous castings up to 5 tons for the manufacture of Turbo-Alternator Plant of all sizes up to the largest. A considerable amount of machine moulding is also handled.—Applications, which should be addressed to PERSONNEL MANAGER, should give age, education and experience in chronological order.

PATTERNMAKERS required, used to first-class Wood and Metal work. Excellent conditions, canteen, music while you work, etc., top wages and bonus, by the oldest (85 years) established firm, with the absolute highest reputation. Main suppliers for many years to all firms of importance in the entire country and the finest Plant and Equipment in the world.—Apply WRIGHT & PLATT, LTD., the World's Largest Engineering Patternmakers, Irving Street, Birmingham. Vacancies at Manchester branch. Apply Springfield Lane Works, Salford, 3.

SITUATIONS VACANT—*contd.*

FLOOR MOULDERS FOR AUSTRALIA. —Progressive Alloy Steel Foundry in Australia requires two experienced Floor Moulders. Good wages and amenities. Assisted passage paid and accommodation arranged for single men. Foundry Manager at present in England, and will interview.—Please apply Box FM966, FOUNDRY TRADE JOURNAL.

JUNIOR METALLURGIST for H.F. Furnace work in progressive foundry in Australia. Experience in alloy steels and modern foundry techniques essential. Passage paid and accommodation arranged. Foundry Manager at present in England and will interview.—Please apply Box JM967, FOUNDRY TRADE JOURNAL.

ENTHUSIASTIC FOUNDRY CHEMIST, with sound knowledge of Core Binders and all Foundry Materials, required. To control and check raw materials and all production. Able to investigate and develop new products, and visit customers to demonstrate same.—Apply, with full particulars of training, previous employment, age, salary required, etc., in confidence, Box EF946, FOUNDRY TRADE JOURNAL.

UGANDA.

MASTER (TECHNICAL) required to teach FOUNDRY-PRACTICE and associated technical subjects to African boys at Kampala Technical Institute. A well equipped foundry and pattern-making shop is provided and ample opportunities exist for building up a central foundry school. Higher National Certificate or Full Technological City and Guilds required, or Final Certificate with evidence of training in ancillary subjects. Apprenticeship and trade experience essential. Teaching experience and/or Teacher's Certificate desirable. Upper age limit 45. Post permanent and pensionable or on agreement as desired. Home superannuation rights preserved. Salary £762-£1,404, plus 10 per cent. non-pensionable cost-of-living allowance. Quarters at low rental. Free passages. Generous home leave. Tour of service, 30-36 months. Low income tax.—Applicants should write for further particulars and application forms to the DIRECTOR OF RECRUITMENT (Overseas Service), Colonial Office, Sanctuary Buildings, Great Smith Street, London, S.W.1, quoting BCD 114/9/07.

ASSISTANT METALLURGIST required to supervise metallurgical section of Development Department of a large Steel Foundry and Engineering Works. Good background in ferrous metallography is essential.—Replies, stating age, experience, etc., as well as an indication of salary required to Box AM956, FOUNDRY TRADE JOURNAL.

ARCHITECTURAL Metal Workers and Founders require ASSISTANT MANAGER. Preference given to applicant with several years' experience in Foundry work (ferrous and non-ferrous); practical and theoretical, including estimating. Progressive position to right man. State full particulars where trained, also age, etc.—Box AM940, FOUNDRY TRADE JOURNAL.

SITUATIONS VACANT—*contd.*

VITREOUS ENAMEL.—Young man, with works experience on control, required as TECHNICAL REPRESENTATIVE AND SERVICE ENGINEER. Alternatively, young METALLURGIST for training as above.—Apply Box VE965, FOUNDRY TRADE JOURNAL.

PATTERNMAKERS wanted early after Christmas for Architectural and Commercial Foundry work. Write stating age, experience and salary required. Box 339, W.B.G., 39, Cheapside, London, E.C.2.

APPLICATIONS are invited from young men with ability and energy for Technical Staff positions in an alloy-steel Foundry using the shell mould and precision casting processes.

Applicants should have had experience in the following fields:—

(1) Either foundry methods, or metallurgy, including H.F. steel melting.
(2) Practical foundry management in a precision casting foundry or a small alloy steel foundry.

Applications to the SECRETARY, Osborn Precision Castings, Ltd., Clyde Steel Works, Sheffield.

PNEULEC will appoint representative to follow Mr. S. E. Smith, who retires July, 1955. Area to be covered is Scotland and N.E. England. Applicants would need (1) to have foundry knowledge with engineering background, (2) to be capable of making proper survey and advise on installation, and (3) provide after sales service. This job calls for appreciation of the opportunities which exist by way of improving working conditions in foundries. PNEULEC LIMITED, Mafeking Road, Smethwick, Nr. Birmingham.

YOUNG man, aged 22/24, with either foundry or pattern shop experience, required for Estimating in Steel Foundry Sales and Estimating Office. Write giving details of experience to Box YM963, FOUNDRY TRADE JOURNAL.

METALLURGIST — ASSISTANT required by large mechanised foundries producing high duty cast irons. Work will cover all branches of metallurgical control and development. Excellent opportunity for keen young man to join expanding concern situated in pleasant country surroundings. Only applicants with Iron Foundry and Laboratory training will be considered. Apply giving full details of age, experience, etc., to Box MA964, FOUNDRY TRADE JOURNAL.

FOUNDRYMAN required, experienced in ferrous and non-ferrous foundry practice, capable of training unskilled labour and apprentices in Moulding, Core-making, Melting, etc. This position should appeal to a person over 50 years of age interested in developing good craftsmanship.—Applicants should give full details of education, past experience, and present salary to Box J.977, WILLING'S, 362, Grays Inn Road, London, W.C.1.

EXPERIENCED FOREMAN required for Steel and Iron Foundry. Apprentice trained. Must have had previous supervisory experience.—Write, stating age, experience, and salary required.—Box EF959, FOUNDRY TRADE JOURNAL.